

**City of Mountain Brook
Public Works Department**

**MOUNTAIN LN AND MONTEVALLO LN AREA
DRAINAGE IMPROVEMENTS
PROJECT MANUAL
Bid #B-20240415-925**

OWNER: City of Mountain Brook, Alabama

CONTRACTOR:

CONTRACT DOCUMENTS

I. Invitation for Bids

II. Specifications

1. General Requirements
2. Supplementary and Technical Specifications
3. Drawings or Plans

III. Instructions to Bidders

IV. Contractor Qualifications/Requirements for Award

V. Contract Award Process

VI. Forms/Exhibits for Project

EXHIBIT A - Contractor Bid Response Form

EXHIBIT B - Bidder Qualification Form

EXHIBIT C - Form of Construction Contract

EXHIBIT D - General Conditions of the Contract

EXHIBIT E - Supplementary and Technical Specifications

EXHIBIT F - Drawings (or Plans)

VII. Anticipated Bid/Award/Project Schedule

I. INVITATION FOR BIDS

CITY OF MOUNTAIN BROOK - INVITATION FOR BIDS
MOUNTAIN LN AND MONTEVALLO LN AREA
DRAINAGE IMPROVEMENTS– BID # B-20240415-925

Bid Submission Deadline & Bid Opening Time:
Address for Bid Submission

Tuesday May 7th – 10:00 a.m. C.D.T.
City Hall - City of Mountain Brook
56 Church Street,
Mountain Brook, AL 35213-3700
ATTN: City Manager/Purchasing Agent

The City of Mountain Brook, Alabama (“City”) invites interested contractors to submit sealed bids to the above noted address for the award of a contract (“Contract”) for drainage improvements Mountain Ln and Montevallo Ln in the City (the “Work” or “Project”). The principle items of the Work generally consist of the installation of gabion baskets along a channel, associated landscaping, removal of existing storm pipes and structures, installation of various size storm pipes and structures, and related work associated with the drainage improvements. Bids must be submitted by the time and date specified above, at which time those bids will be publicly opened and read as soon thereafter as practicable. Each bidder is responsible for mailing or delivering its bid so that it will be actually received at the above address and location at or before the time of the specified bid opening; bids received after that time will not be considered. Bidders who plan to attend the bid opening should contact Janet Forbes at 202-802-3800 to receive access to City Hall and other information about that opening.

Interested contractors may obtain the Project Manual (which includes the Specifications and all other Contract Documents) by contacting Mr. Mark Simpson at msimpson@schoel.com or downloaded online at the City of Mountain Brook’s website at <https://www.mtnbrook.org/rfps>

The City requires that the Work be substantially completed, in accordance with a phased schedule detailed in the Project Manual, within 150 days after the Notice to Proceed. The City will conduct a **MANDATORY** Pre-Bid Conference in connection with this Project on Tuesday, April 23rd at 10:00 pm C.D.T. The meeting will take place at City Hall, City of Mountain Brook, 56 Church Street, Mountain Brook, AL 35213. Technical questions about the Work or Project should be directed in writing to Mr. Mark Simpson at msimpson@schoel.com. Questions about purchasing or other matters related to transacting business with the City may be directed to Steven Boone, Finance Director, City of Mountain Brook, at boones@mtnbrook.org.

To be considered for the award of the contract on this Work, an interested contractor must attend the mandatory pre-bid meeting, complete and return the Contractor’s Bid Response Form, and provide other information requested in the Project Manual. Also, the successful contractor must possess the minimum experience and qualifications to perform the Work as specified in those materials.

Each bidder is required to furnish with its bid a bid bond, cashier’s check or other similar form of bid security acceptable to the City in the amount of not less than 5% of their bid, but not more than \$10,000.00, to secure its intent to perform the Work if it receives the award. Further, when selected, the successful contractor must provide a Performance Bond in the amount of the Contract Price and a Labor & Materials Bond in the amount of half that Price.

The award of the contemplated Contract will be made in compliance with Ala. Code §39-2-1 et. seq.(1975). The award will be made to a responsible contractor that meets minimum qualifications and submits the lowest responsive bid that the City determines is most advantageous to it. In making that determination, the City, in the exercise of its sole judgment, may consider factors other than just price. These factors will include, but not be limited to, the bidder’s experience in successfully completing similar projects, its Claims History, its resources to perform the obligations under the Contract on an expedited basis, and the training and experience of the Project Team that it will provide to serve the City.

The City reserves the right to accept or reject any or all bids and to waive formalities related to submitted bids.

s/ Sam S. Gaston
City Manager/Purchasing Agent

April 14th, 2024

Dates of Advertisement:
April 18th, 2024

II. SPECIFICATIONS

1. GENERAL REQUIREMENTS.

The City of Mountain Brook (“City”) anticipates awarding a contract (“Contract”) for Mountain Ln and Montevallo Ln Area Drainage Improvements in the City (the “Work” or “Project”). The successful contractor (“Contractor”) shall be responsible to furnish all labor, supervision, materials, tools, fuel, power, equipment, incidentals, and services required to complete the Project in conformity with the requirements in the Specifications and all other Contract Documents.

The Work on the Project principally consists of the operations that are detailed on EXHIBIT E (the Supplementary and Technical Conditions) and EXHIBIT F (the Drawings and Plans) various drainage improvements. The operations on EXHIBIT E fall into the following categories:

- (1) Item 1 – Drainage improvements – operations required for demolition of existing storm structures and pipe, clearing and other demolition necessary. earthwork, gabion wall construction, landscaping, stormwater structures and pipe installation, utility relocates, paving, and all ancillary operations related thereto. On EXHIBIT A (the Contractor Bid Form), the City will compensate Contractor for its work on Item 1 on a Unit Price. When proposing its Unit Price for Item 1 on EXHIBIT A, Contractor shall include in that Unit Price all expenses it may incur related to work specified in Item No. 1 (including, but not limited to, materials, equipment, labor, incidental costs, and all ancillary operations to perform the contemplated functions).
- (2) Item 2 – Alabama Power Line Relocates – coordination associated with the relocation of power pole guy wires and other pole relocations as required by Alabama Power to accommodate the Project. The City will compensate the Contractor for amount shown on the Contractor Bid Form.

In completing EXHIBIT A, Contractor’s Total Bid shall be the sum of its Unit Price for the work contemplated on Item 1 Drainage Improvements, and Item 2 Alabama Power Line Relocates.

In addition to the provisions, terms and understandings between the parties set forth in other Contract Documents (as defined below), the following provisions in these Specifications also apply to the Contract.

A. Contract/Contract Documents/Intent of Documents. As used herein, the term “Contract” refers to the written agreement between the City and the successful Contractor for the performance of the Work. The Contract includes all the following documents and any approved addenda and change orders thereto: Invitation for Bids; Specifications (including General Requirements, Supplementary or Technical Conditions, Drawings (or Plans) and all other documents in this Project Manual); Instructions to Bidders; Contractor Qualifications/Requirements for Award; Contract Award Process, completed EXHIBIT A - Contractor Bid Response Form, completed EXHIBIT B - Bidder Qualification Form, EXHIBIT C – Construction Contract, and EXHIBIT D – General Conditions of the Contract, and other EXHIBITS (collectively, the “Contract Documents”).

The intent of the Contract Documents is to prescribe the operations that the Contractor must undertake to fully comply with its obligations under the Contract. The Contractor shall do all work as provided in the Contract, and shall do such additional, extra, and incidental work as may be reasonably necessary to complete the work in a satisfactory and acceptable manner. Any work or material not shown in the Specifications, but which may be fairly implied as included in any item of the Contract shall be performed and/or furnished by the Contractor without additional charge thereof.

All Work shall conform to the Specifications and Conditions for the Project. Any deviation from those Specifications which may be required by the exigencies of construction must be approved by the Architect (or

Engineer) and City Project Representative in writing. Work performed that is not in conformity with the Specifications will be removed and replaced at Contractor's risk and expense. Defective materials shall be removed immediately from the Work site.

B. Bidder's Obligations to Examine Documents and Work Site. Excepting Addenda, bidders are advised that the Contract Documents constitute all the information which the City will furnish and that is applicable to the Project. No other information furnished verbally or otherwise by the City (or any of its representatives) prior to the execution of the Contract shall become a part of or change the Contract. Prior to submitting their bid, bidders are presumed to have carefully (a) read the Contract Documents (including the Specifications); (b) visited the site of the Work ("Work Site(s)"); (c) examined local conditions; and (d) determined for themselves by their independent research any difficulties that they may encounter relating to the accessibility of the Work location, attending circumstances affecting the cost of performing it and the time required for completion of the Project, and also considered all information that it deems pertinent to calculating and making its proposal. Further, bidders shall rely exclusively upon their own estimates, investigations, and other data which they deem necessary for submitting their respective proposals. The City may assume that, by making a proposal, a bidder has made these examinations and investigations, and considered all factors pertinent to it.

C. Contract Time. The Contractor shall substantially complete the Project on an expedited basis within 150 days after the City issues its Notice to Proceed, subject to the phasing, if any, as set forth in the construction documents.

The City agrees that, if Contractor is unable to complete the Work by the Contract Time because of unforeseeable events or matters that are beyond its reasonable control (e.g., strikes, shortages of material, governmental preemption in connection with a national emergency and Acts of God) and that do not result from its negligence, the time for completing the Work may be extended by the length of time equal to the duration of any such events or matters. Such extensions shall be considered only when submitted to the City Project Representative in writing within ten (10) days from and after the time when any such alleged cause of delay shall occur.

D. Payment/Estimated Quantities/Unit Price Firm/Full Compensation.

- (i) **Payment.** After Contractor successfully completes its Work on the Project, it will pay Contractor for that Work (or part thereof) based on the amount(s) Contractor sets forth in EXHIBIT A (the Contractor Bid Form). If the Contract Time is 30 days or less, City will make one payment for all the Work at the conclusion of the Project. If the Contract Time is greater than 30 days, progress payments may be made pursuant to the provisions in Articles 29, 30 and 31 of EXHIBIT D (General Conditions of the Contract).

To the extent that any payment(s) to Contractor for operations contemplated herein is based on a unit price, City will make payments to Contractor for those operations based on the actual quantities that it successfully installs and incorporates into the Project.

NOTE; THE PROVISIONS IN SUBPARTS (ii) AND (iii) BELOW ARE IF PAYMENT FOR WORK IS BASED IN PART OR WHOLE ON UNIT PRICES.

- (ii) **Estimated Quantities.** To the extent that payment for work is based on unit pricing, the Quantities shown on the Contractor Bid Response Form or elsewhere in the Contract Documents are the City's good faith estimates of the scope of Work that it approximates will be required to complete the Project (or part thereof). These estimations are given for the sole purpose of evaluating the respective bids that are submitted and awarding the contemplated Contract. The City does not warrant the accuracy of these estimates and approximations, that these estimated quantities will be required to complete the Project, that the successful Contractor necessarily will receive the amount of compensation calculable with these estimates, or that it will receive any minimum level of compensation for Work that is

performed on a unit price basis. Also, Contractor understands and agrees that it may be required to incorporate more or less than the estimated quantities of specified materials to complete the Project.

- (iii) Unit Price Firm. To the extent that payment for work is based on unit pricing Contractor agrees and understands that, during the Project, its proposed unit price(s) will remain firm and any increase or decrease in quantities of specified materials or operations will not change the unit prices that it proposes.
- (iv) Total Compensation. The compensation paid by the City to Contractor for the Work is intended to constitute full payment to it for all of the following: it furnishing all labor, materials, tools, equipment and incidentals; for it performing all work and operations embraced under the Contract; for all loss or damage incurred by it that arise out of the nature of the Work; for any unforeseen defects or obstructions which may arise during the prosecution of the Work and before its final acceptance by the City; for all risks connected with the prosecution of the Work, submitting a bid or entering the Contract; for all expense incurred by or in consequence of suspension or discontinuance of such prosecution of the work herein specified; and for completing the work in an acceptable manner according to the Specifications.

E. Term. Unless otherwise extended by agreement, the term of this Contract shall commence on the date the Construction Contract is last executed by a party and thereafter continue in effect until either (a) the end of the Contract Time, or (b) City's Final Acceptance of the Work, whichever comes first (the "Term"). Notwithstanding the provision immediately above or any other provision in the Contract Documents, the Contract or Work on the Project may be terminated or suspended before the expiration of the Term on any of the conditions or circumstances that are set forth in Articles 26, 27 and 28 of the General Conditions of the Contract.

F. Contractor & Subcontractor Insurance Requirements. See Article 37 of the General Conditions of Contract.

G. Indemnification & Other Contractor Responsibilities for Claims Arising from Work. See Article 36 of the General Conditions of the Contract.

H. Clean Up. See also Article 48 of the General Conditions of the Contract.

(i) Throughout the progress of the Work, Contractor shall keep the respective construction or Work Site areas (including, but not limited to, the storage areas used by it) free from accumulation of waste material or rubbish and shall store its materials and equipment in a neat and orderly manner.

Immediately upon completion of any section of the Work and before payment therefore has been made, Contractor shall remove from the site all construction equipment, temporary structures, and debris and shall restore the site to a neat, workmanlike condition. Further, Contractor shall dispose of waste material from each Work site at locations that are not at those sites, have been selected by the Contractor and have been determined by it to be proper and lawful for disposal of the type of material being removed.

(ii) Where the Contractor has performed operations on or has made use of private property for storage of materials or for other purposes, it shall obtain a satisfactory release from the owner of said property after completion of the work and the removal of all materials and equipment therefrom.

(iii) After completion of operations contemplated hereunder at the site of each part of the Work, Contractor shall restore all surfaces and conditions there to a neat and orderly condition, and shall remove all construction equipment, tools and supplies therefrom.

I. Quality of Materials. Only materials conforming to the requirements of the Specifications shall be used in the Work. See specified materials for Project in EXHIBIT E – Supplementary and Technical Specifications.

J. Storage of Materials. Materials intended for incorporation into the Work shall be stored in a manner that will insure preservation of their quality and fitness for that use. Storage facilities shall be provided at the expense of the Contractor. Unless otherwise agreed, the Contractor shall be responsible for any loss, damage or deterioration of materials and equipment it places at or near a Work site that is caused by improper protection from weather, vandalism, theft, or other conditions.

K. Compliance with Laws/Permitted Hours for Construction. During the term of the Contract, Contractor shall observe and comply with all Federal and State laws and local ordinances and regulations which in any manner affect the conduct of the Work or any Work site (collectively “Laws”), including, but not limited to, Laws regarding the protection of the environment and those regarding protection and the safety of its workers. Further, Contractor shall observe and comply with all orders and decrees of any governmental agency, body or tribunal having jurisdiction or authority over the Work or operations at any Work site which may be in effect at the commencement of the Work or subsequently be enacted during the term of the Project.

Per City of Mountain Brook Ordinance No. 1234, Adopted August 12, 1996, work of the nature contemplated on the Project may be conducted in the City at the following hours: (i) Monday-Fridays: 7:00 a.m. – 8:00 p.m, except that work may commence at 6:30 a.m. on M-Fs on which Daylight Savings Time is observed; and (ii) Sat, Sun & Holidays: 8:00 a.m. – 8:00 p.m. When City school is in session, in accordance with the 2024 academic calendar, no construction traffic will be allowed during the following hours: (i) 7:00 a.m. – 8:15 a.m. and (ii) 2:30 p.m. – 3:30 p.m.

L. Permits. See Article 44 of the General Conditions of the Contract.

M. No Waiver by City. The City shall not waive any of its rights under the Contract or any Contract Document by occurrence of the following: any inspection of the Work by the Architect (or Engineer) or the City Project Representative (or by their duly authorized representatives); the issuance of any order, measurement or certificate following any such inspection; payment of money by the City for Work; the City’s acceptance of any Work; or the City’s grant of any extension of time to complete work.

Further, no forbearance or delay on the part of the City in enforcing any of its rights under the Contract shall not be construed as a waiver of those rights or a subsequent waiver of breach. The City will not waive any terms of the Contract unless expressly waived in a writing signed by the parties.

N. No Assignment or Subcontracting without City’s Consent. See Article 39 of the General Conditions of the Contract.

O. Prosecution of Work. In performing its Work and operations Contractor represents that it shall

(i) continuously and diligently prosecute the Work in such order and manner to complete it in a safe, workmanlike and timely manner consistent with the schedule for the Project;

(ii) exclusively be responsible for training and supervising all its personnel, and take necessary actions to ensure that that its workmen have sufficient skill and experience to properly perform the work assigned to them; and

(iii) furnish an ample force of trained laborers, tools, supplies and equipment that it considers necessary to complete the Work at a satisfactory rate of progress.

P. Water/Electricity/Gasoline/Supplies. Unless otherwise stipulated in the Construction Contract, Contractor, at its expense, is responsible to provide and maintain at an adequate supply of water, electricity, gasoline, or other incidental supplies required to prosecute the Work.

Q. City's Rights to Suspend Work or Terminate Project & Contract for its Convenience. See Articles 26-27 of the General Conditions of the Contract.

R. Close out of Contract. See Article 34 of the General Conditions of Contract.

S. Project Representatives/Notices. Each party shall appoint a representative(s) who shall coordinate with the other party on matters pertinent to the performance of the Work, the Project and administration of the Contract (the "Project Representative(s)"). The names of these Representatives may be indicated on the Construction Contract. The designated Project Representatives shall have the authority to act on behalf of its respective organization to transmit instructions, receive information and administer the Contract consistent with its terms and conditions. Either party may designate a Project Representative other than the person initially designated by providing written notice thereof to the other.

Any notice required under the Contract shall be sufficiently given when given in writing and sent to the appropriate Project Representatives via United States certified mail, return receipt requested, or via overnight courier with receipt verification to the address set forth herein, or by personally delivering such notice to that party.

T. Responsibility for Safety at Work Site. Contractor exclusively shall be responsible for the safety of its personnel (and that of any subcontractor or subcontractor personnel), to protect its equipment and to protect the Work while performing its operations on or about any Work Site. In addition, Contractor shall undertake reasonable precautions and practices that it determines are necessary to maintain a safe work environment at each Work Site, or that may be needed to protect the public, City personnel and City property from injury, damage, or loss during its operations.

The City makes no representation and gives no warranty that its Work Sites (or any equipment or improvements thereon) are safe or fit for the performance of the Work. Prior to commencing its operations, Contractor (and its representatives) agrees to thoroughly examine, inspect, and become familiar with each Site, determine that the Work at each such Site can be completed there in an orderly and safe manner and implement whatever precautions, practices, or actions that it deems are required to safely the Work in those locations.

U. Security at Work Site. Contractor, at its own expense, shall furnish and erect such barricades, fences, signs, lights, and danger signals at Work Sites and shall provide such watchmen as are reasonably required to protect third persons, property in the area and the work from injury, damage, or loss. Contractor shall be solely responsible for all damages to the third persons, property or the Work Site arising from its breach of this obligation. The Contractor's responsibility to protect the public, property and Work site shall not cease until the City finally accepts the work.

V. Miscellaneous Other Contract Terms

(i) Independent Contractor. Contractor is an independent contractor of the City. The Contract does not create any partnership, joint venture or principal-agent relationship between the Contractor and the City. Further, Contractor (and its employees, representatives, or subcontractors) exclusively controls the means and methods it uses or selects to perform the Work, and the City retains no control or authority with respect to those means and methods.

(ii) Immigration Law Compliance. See Article 44 of the General Conditions of the Contract.

(iii) Contractor Operations Related to or Affecting Use of City Streets and Ways: If the Work encompasses or Contractor performs any operations that relate to, affect, or impact the use of City streets, alleys, ways, or rights of way in any manner, the following understandings apply:

(a) License to Use City Streets. During the period of Contractor's Work at a site, the City grants it a license to occupy such portions of its streets, ways or public property as will not unduly restrict vehicular or pedestrian traffic or endanger the public.

(b) Traffic Control: The Contractor is exclusively responsible for all traffic control related to the performance of the Work. This responsibility includes, without limitation, determining and implementing all appropriate measures to place signs, warn drivers and others affected by the Work, and utilization of flag persons.

(c) City Street Plans. Upon request by Contractor, the City may furnish any maps of streets that it maintains in areas where the Work will be performed. If those maps are supplied, Contractor acknowledges that the information and data furnished on them are not warranted by the City for accuracy, completeness, or reliance by the Contractor in performing the Work, but instead are furnished as general information only. Further, Contractor agrees and understands that the City does not warrant the locations of gas mains, water mains, conduits, sewers, or any other surface or subsurface improvements that may be indicated on any City maps, that the City assumes no responsibility for failing to depict any surface or subsurface improvements on those maps or failing to depict them in their exact location, that inaccuracies in these maps will not be considered sufficient basis for claims for extra work or for increasing its compensation for Work, and that the City is not responsible for any deduction, interpretation, or conclusion that the Contractor may make or draw from any of them.

(d) Contractor shall store construction materials and equipment needed by it to perform the Work on or about City ways and property in such manner as will not unreasonably impair, block, or restrict the convenience and access for the public and others affected by its operations.

(e) No City street, road or alley shall be closed without the permission of the City Project Representative and its Fire Department. Where traffic is temporarily diverted from the area of a Work site, the Contractor shall provide all materials and perform all work needed to construct and maintain any required temporary roadways and structures.

(iv) Operations Affecting Use of Right of Way or Property Owned by Utilities & Other Governmental Entities.

If performance of the Work encroaches upon or impacts the right-of-way, easements, facilities, or property owned by any public utility, governmental or public entity or railway ("Third Party Right of Way"), the following understandings will apply:

(a) City will obtain all easements or authority necessary to enter upon or use Third Party Right of Way.

(b) Notwithstanding subpart (a), Contractor shall (1) make all arrangements to coordinate its operations with the entity owning such Third Party Right-of-Way for the actual construction, (2) perform the Work on or across such Third Party right-of-way in the manner and at the times agreed upon with its owner, (3) shall pay the costs, if any, of temporary construction required by the owner thereof as a means of providing safe and continuous operation of its facilities during the construction period and to protect its facilities and the general public, and (4) where required by such owner, post with it any performance bond to guarantee the satisfactory replacement or repair of materials, paving or grading within such right-of-way.

(c) if prosecution of the Work requires that any facilities or improvements of public utilities or other governmental entities to be cut, moved, relocated, rebuilt, or otherwise disturbed in any way, the Contractor shall notify the utility or entity to make the required changes, and, prior to making application to the utility, make all preliminary arrangements with them regarding those accommodations. The City shall not be responsible for any delays in the accomplishment of the required action by a utility by reason of Contractor's failure to properly schedule same, and in no case shall the Contractor be allowed any claim for extension of time or additional compensation based on failure of the utility to act or accommodate the Work within the stipulated period.

(d) Service Connections. If service connections or lines from water or gas mains or sewers to the premises of a property are disconnected, broken, damaged, or otherwise rendered inoperative for any reason by the Contractor in prosecuting the Work, Contractor, at its own expense, shall repair or replace same and restore service to the premises at the earliest possible time.

(e) Temporary Sewer and Drain Connections. If existing storm or sanitary sewers are required to be removed, relocated, or rebuilt to prosecute the Work, the Contractor, at his own expense, shall provide and maintain temporary outlets and connections for all private or public drains, sewers, and sewer outlets connected to or served by the sewers to be rebuilt, and where necessary, shall provide adequate pumping facilities and maintain these services until such time as the permanent sewers and connections are built and in service.

(f) Contractor shall not store all materials and equipment at a Work site in a manner that restricts, blocks or limits access to any fire hydrant, valves, manholes and other utility appurtenances.

(v) Use, Restoration & Other Responsibilities Concerning Private Property. During its operations, Contractor shall not enter upon private property for any purpose without first obtaining permission from its owner. Contractor shall be responsible for the preservation of and shall use every precaution necessary to prevent damage to all trees, shrubbery, fences, culverts, bridges, pavement, driveways, sidewalks, or other improvements on private property (including all water, sewer, gas, telephone, and electric lines serving that property) along or adjacent to the Work. Not less than twenty-four (24) hours in advance of its operations, Contractor also shall notify the proper representatives of any public service corporation, organization, or individual owning property along or adjacent to the location of the Work which might interfere with their operations or use of their respective properties.

(vi) Sanitation. Contractor shall provide and maintain the necessary sanitary conveniences for the use of its laborers at the Work sites, and these conveniences, if reasonably possible, shall be secluded from public observation. Sanitary conveniences and practices used by Contractor at a Work Site shall comply with state and local regulations.

(vii) Changes in Plans. See Article 19 of General Conditions of the Contract.

(viii) Samples and Tests of Materials. Where required by the Specifications, tests and/or inspection of materials shall be performed by commercial laboratories approved by that professional. Unless otherwise specified, those tests shall be made in accordance with the latest standard methods of the American Society for Testing Materials. Unless otherwise agreed, the costs of such tests, sampling and inspection shall be borne by the Contractor, and it shall furnish evidence satisfactory to the Architect (or Engineer) that the materials have passed the required tests and inspections prior to the incorporation of them into the Work.

(ix) Inspections of Work. See Article 16 of General Conditions of the Contract.

(x) City Audit Right/Contractor's Retention of Records. Upon reasonable advance notice from the City during the term of the Contract or in a periodic audit that follows the completion of part or all of that Work, Contractor, at its expense, agrees to produce for inspection those records maintained by it with respect to the Work for the City to evaluate whether it has properly completed, accounted and performed the transactions that are contemplated hereunder. To facilitate any such inspection or audit, the Contractor agrees that, for a period of no less than (2) years following the performance of its Work or the expiration (or earlier termination) of this Contract, it will maintain its reports, logs and records concerning its performance of Work, and the accounting, billing, or other financial records that the Contractor generates regarding same.

(xi) Additional Representations of Contractor. As further inducement to enter this Contract, the Contractor represents and warrants to the City that all actions required to be taken by it or on its behalf to execute the Contract, and to perform its obligations and agreements thereunder have been duly taken.

(xii) Entire Agreement. The Contract Documents comprise the entire agreement between the parties concerning the matters therein. These terms, provisions and conditions in the Contract supersede all prior negotiations,

representations, or agreements, either written or oral, concerning the subjects herein, and any such prior understandings concerning these matters are of no effect and are merged into this Contract.

(xiii) Ineffective Provisions in Contractor Documents. The parties agree that no terms, provisions, or conditions that are stated in any Contractor work or purchase order, proposed invoice or other document generated by the Contractor in connection with the Work are not incorporated into or form part of the Contract. Notwithstanding the existence of any such documents, the parties understand, agree and covenant as follows:

(a) The City shall not be liable to the Contractor for attorney's fees, court costs, litigation expenses, and like charges except and to the extent such fees, costs, and charges would be assessed against the City under applicable law in the absence of any contractual provision imposing or assigning liability therefor;

(b) The City shall not be liable for any late payment charges, interest, or fees on any delinquent billing for goods, materials, or services; provided that, in the event Contractor should successfully prosecute an action against the City to collect delinquent amounts owed hereunder, Contractor may be awarded pre-judgment interest related to that delinquency if that recovery is allowed under applicable law.

(c) The City will not indemnify, hold harmless, or release the Contractor or any other person, firm, or legal entity for, from, or with respect to any claim, cause of action, cost, charge, fee, expense, or liability whatsoever arising out of or relating to the subject matter of the Contract or the performance or nonperformance thereof; and

(d) Unless expressly stated in the Contract, the City does not waive its right to assert or pursue any remedy or claim for relief of any kind that it may have against the Contractor or any other person, firm, or entity for any actual or alleged default or other breach of legal duty on the part of the Contractor or any person, firm, or entity in privity therewith or acting on Contractor's behalf in connection with the performance of the Work. Any limitation or restriction regarding the type, nature, form, amount, or extent of any right, remedy, relief, or recovery that would otherwise be available to the City (or the City) is expressly disavowed, excluded from the Contract, and void.

(xiv) The Contract is made only for the benefit of the City and the Contractor. Unless otherwise provided in the Contract, it is not intended, nor shall it be construed, to grant or bestow any benefit, right or privilege to any third party.

(xv) The Contract may be amended or modified only by written instrument signed by both parties. Further, neither the scope of Work nor the time of completion of Work operations may be changed except in accordance with the terms of a written change order signed by City and Contractor.

(xvi) The Contract Documents may be executed in counterparts each of which when executed by the parties shall be deemed to be a complete original. Copies of any of them showing the signatures of the respective parties, whether produced by photographic, digital, computer, or other means reproduction, may be used for all purposes as originals, and shall have the same legal force and effect as an original document.

(xvii) If any provision of this Contract is held to be invalid, illegal, or unenforceable by a court of competent jurisdiction, the remaining provisions of it shall remain in full force and effect.

(xviii) Exclusion of Consequential Damages. NOTWITHSTANDING ANY OTHER PROVISION IN THE CONTRACT, THE CONTRACTOR AGREES THAT, IN THE EVENT IT MAKES OR ASSERTS ANY CLAIM, DEMAND OR ACTION OF ANY TYPE AGAINST THE CITY ARISING FROM ITS ALLEGED BREACH OF THE CONTRACT OR THE CITY'S FAILURE TO PERFORM ANY OF ITS OBLIGATIONS THEREUNDER, THE MAXIMUM AMOUNT THAT THE CONTRACTOR MAY RECOVER FROM THE CITY AS DAMAGES IN ANY SUCH ACTION IS LIMITED TO THE CONTRACTOR'S ACTUAL, DIRECT DAMAGES ARISING FROM

THE CITY'S BREACH. THE CONTRACTOR AGREES AND ACKNOWLEDGES THAT THE TERMS IN THIS PROVISION WERE PROPOSED AND BASED ON THE ASSUMPTION THAT THIS SPECIFIC LIMITATION IS APPLICABLE, AND THAT THE CITY WOULD NOT HAVE ENTERED INTO THE CONTRACT WITHOUT THE INCLUSION OF THIS LIMITATION. IN NO EVENT WILL THE CITY BE LIABLE TO THE CONTRACTOR FOR ANY INDIRECT, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, RELIANCE OR SPECIAL DAMAGES (INCLUDING WITHOUT LIMITATION DAMAGES FOR LOST PROFITS, LOST ADVANTAGE, LOST OPPORTUNITY, LOSS OF SAVINGS OR REVENUES OR FOR INCREASED COST OF OPERATIONS) ARISING FROM ANY BREACH OR ALLEGED BREACH OF THIS AGREEMENT BY THE CITY.

(xix) Applicable Law. The meaning, legal effect, and enforcement of terms and provisions of the Contract and the resolution of any disputes arising thereunder or relating thereto shall be governed by the laws of the State of Alabama, except to the extent otherwise required by applicable conflict-of-law principles.

(xx) Construction of Contract. Except as expressly stated herein, nothing in this Contract shall be construed to create or impose any duty or liability on the City, to create a right or remedy in favor of the Contractor against the City, or to restrict or abrogate any right or remedy that is available to the City against the Contractor or any other person, firm, or entity. Furthermore, if any ambiguity in the terms of this Contract is determined to exist, no presumption shall be made that either of the parties drafted the Contract.

(xxi) Defined Terms. The Defined Terms used in this Project Manual have the meaning set forth in the other General Conditions of the Contract, Construction Contract, and other Contract Documents.

2. SUPPLEMENTARY AND TECHNICAL SPECIFICATIONS

See EXHIBIT E below.

3. DRAWINGS OR PLANS

See EXHIBIT F below.

III. INSTRUCTIONS TO BIDDERS

1. Bids and associated completed forms should be placed in sealed envelope or container that is addressed to City of Mountain Brook, Alabama, Attention: City Manager, City Hall, 56 Church Street, Mountain Brook, AL 35213-3700, and delivered on or before the local time and date specified in the Invitation to Bid.
2. The following information should be clearly shown on the exterior of the sealed bid: (a) BID FOR MOUNTAIN LN AND MONTEVALLO LN AREA DRAINAGE IMPROVEMENT PROJECT; (b) Date and Time of Bid Opening; (c) Name of Bidder; and (d) Bidder's State of Alabama License number.
3. The completed Contractor Bid Response Form (see enclosed **Exhibit A**) and completed Bidder Qualification Form (see enclosed **Exhibit B**) are due no later than Tuesday May 7th, at 10:00 a.m. The bidder shall be responsible for taking whatever measures are necessary to ensure that its response reaches the City at the designated address on or before the local time and date specified. The City shall not be responsible for, and may not consider, any proposal delayed in the postal or other delivery service, or in the City's internal mail system, nor any late proposal, amendment thereto, or request for withdrawal of proposal received after the time and date specified. Proposals received after the time and date specified on the bid submission deadline will not be opened and will not be considered for award.
4. Each bidder shall submit two (2) copies of their responses.
5. Bids must be entered on the Contractor Bid Response Form that is provided herein. Each bidder shall fully complete all sections of this Form, and sign in the appropriate places thereon in the presence of a notary.
6. Bids that are completed in pencil or faxed to the City will not be accepted.
7. All questions and clarifications regarding this Bid, Specifications or the Work must be submitted in writing by May 1st, 2024, at 5 p.m. to the following persons:

Purchasing or Business Questions:

Steven Boone
Finance Director
City of Mountain Brook
boones@mtnbrook.org
(205) 802-3825

Technical Questions:

Mark E. Simpson, PE
Schoel Engineering
1001 22nd Street South
Birmingham, Alabama 35205
msimpson@schoel.com
(205) 313-1155

The City will attempt to respond to such questions by 5:00 p.m. on May 3rd, 2024. No oral answers or interpretations to such inquiries will be provided. The City's response to all questions will be e-mailed to all interested firms that have requested Contract Documents before that time and treated as an Addenda to the Specifications. All Addenda issued shall become part of the Contract Documents for this Bid.

8. Each bidder is responsible for all costs related to the preparation of its Bid Response, its expense of evaluating the Project or Work site and its costs of determining whether to submit a bid.

IV. CONTRACTOR QUALIFICATIONS/REQUIREMENTS FOR AWARD

Interested contractors are required to meet all qualifications in this section to be considered for award of the contemplated Contract. Respondents should complete and return the enclosed EXHIBIT B – the Bidder Qualification Form with their bid. If a respondent does not submit this documentation substantiating that they comply with these qualifications/ requirements in this Section, the City may disqualify them from an award or entering the Contract.

A. Licensing Requirements. To be eligible for the award, the successful Contractor must provide the City evidence that it has or will obtain the following licenses and attach copies thereof the Bidder Qualification Form:

1. State of Alabama General Contractor License - Must include one of the following:
Municipal & Utility; Highway & Streets; Heavy & Railroad; or Specialty Classification: Drainage
&
2. City of Mountain Brook Business License*

(*Note: If this license is not currently held, it must be obtained prior to commencing work.)

The interested contractor also shall attach any other state, county, or local licenses and/or certificates held by it that evidence the contractor's qualifications to perform the Project.

B. Performance of Similar Projects/References. The successful contractor must have performed at least one (1) project that is comparable in scope to this Project for another governmental entity in Alabama within the last five (5) years. References for each such entity served and project performed during this period shall be provided on EXHIBIT B. The City reserves the right to contact references as part of the evaluation and selection process. Information indicating compliance with this qualification shall be provided on Exhibit B.

C. Mandatory Pre-Bid Conference: The City will conduct a mandatory pre-bid conference in connection with this Contract. Interested contractors may direct written inquiries concerning the Project or Contract Documents to the Representatives indicated above.

D. Bid Bond Requirement. Each bidder shall furnish with its Bid a bid bond, cashier's check or other similar form of bid security acceptable to the City in the amount of not less than 5% of their bid, but not more than \$10,000.00, to secure its intent to perform the Work if it receives the award.

E. Other Bonding Requirements. When selected, before commencing work the successful contractor must provide a Performance Bond in the amount of its bid and a Labor & Materials Bond in the amount of half that price.

These bonds shall remain in effect for twelve (12) months after completion of the Work, shall be in a form satisfactory to the City, and the surety for them shall be a reputable bonding company authorized to transact business in Alabama and shall be acceptable to the City.

F. Insurance Requirements. Before commencing its work, Contractor must provide the types of insurance and comply with the insurance requirements set forth in Article 37 of the General Conditions of the Contract (which Conditions are included as EXHIBIT D).

V. CONTRACT AWARD PROCESS

1. Bidder's Intent. By submitting a bid, the bidder accepts and agrees to comply with the Specifications for the Work and obligations in other sections of the Contract Documents, unless otherwise stated in a bid exception that is accepted by the City.

2. Any exception taken by a bidder should be stated in detail, in writing, at the time of its submission. The City reserves the right to accept or reject any such exception taken by the bidder, and deviations from the Specifications or other obligations in the Contract Documents that are not accepted by the City may be grounds for rejecting and disqualifying the bid.

3. The City intends to notify the successful Contractor of the tentative award of the Contract within five (5) days after the bid opening. Following the award, the Contractor will enter the Contract and furnish the required construction bonds (Performance and Labor & Materials Payment) within three (3) days after the award.

4. In determining the entity to whom to make an award, the City reserves the right to:

(a) reject the proposal of any bidder who has previously failed to perform properly or timely complete contracts of a similar nature;

(b) reject the proposal of any bidder which, based on the City's investigation, is not in a position or does not have the resources to satisfactorily and timely perform the contract;

(c) reject the proposal of any bidder who is in arrears or in default to the City upon any debt or prior contract;

(d) reject the proposal of any bidder who has failed to faithfully perform work or services on any previous contract or project for the City that is like that contemplated in this bid;

(e) request that a bidder present additional evidence that it has the ability and possesses the necessary facilities, pecuniary resources, and adequate insurance to comply with the terms of this bid, and require that such evidence be presented within a specified time and to the reasonable satisfaction of the City; and

(f) disqualify a bidder's response because it is not complete. the bidder failed to provide information requested in the bid materials or its bid is irregular (e.g., forms are altered or reflect additions or conditions not anticipated).

5. Contract. Following the award, the successful Contractor shall execute the Construction Contract in substantially the form of **Exhibit C** below.

6. Bids which have been opened and read may not be withdrawn for a period of 30 days after date of opening.

7. Before an award is made, the City reserves the right to investigate the previous experience, financial status, and general ability of the respective bidders to perform the Project.

8. As soon as the bids have been compared, the City may, at its discretion, return the bid guaranties accompanying those bids which in its judgment would not be considered for the award. After the award is made, only the successful bidder's bid guaranty will be retained until the required performance and construction bonds have been executed, after which it will be returned to the bidder.

9. The City reserves the right to accept or reject any or all bids. Further, if bidding contemplates a Base Bid and an Alternate Bid(s), the City may accept the Base Bid and all Alternate Bids, accept the Base Bid and reject any Alternate Bid(s), or accept the Base Bid and less than all Alternate Bids.

10. In determining which proposal is most advantageous to the City, in the exercise of its sole judgment, may consider pertinent factors other than just price. These factors will include, but not be limited to, the bidder's experience in successfully completing similar projects, its Claims History, its resources to perform the obligations under the Contract on an expedited basis, and the training and experience of the Project Team that it will provide to serve the City.

11. The City reserves the right to waive irregularities and technicalities in submitted bids and make the award to the bidder submitting the proposal that is most advantageous to it.

12. Should the bidder to whom the contract has been awarded fail to execute the Contract and furnish satisfactory performance and construction bonds within five (5) days after the notice of award, it shall be considered to have abandoned their proposal; its offer shall be withdrawn, and the amount of the bid security shall be forfeited to the City as fixed and agreed damages. The submission of a bid by any bidder shall be considered as an acceptance by them of this provision.

VI. EXHIBITS

EXHIBIT A - CONTRACTOR BID RESPONSE FORM*

Below is the firm bid of the undersigned to perform the Mountain Ln and Montevallo Ln Area Drainage Improvement Project at the price indicated below. The undersigned submits this Form in response to the City’s Invitation for Bids for this Project. The City may use the address and contact information below for its communications with the undersigned bidder. By submitting a bid, the undersigned acknowledges that it has read and understands the Contract Documents that apply to the Project and conditions for the award of the contemplated Contract and, except as may be listed in any exception sheet, submits its bid and agrees to perform the Work in accordance with the requirements in the Contract Documents.

**OPERATIONS/ESTIMATED QUANTITIES/ UNIT PRICES
BASE BID**

ITEM NO. *	A. DESCRIPTION	B. UNIT	C. ESTIMATED QUANTITY *	D. PRICE BID PER UNIT *	E. TOTAL PRICE BID PER ITEM (COL. C X COL. D)
1	DRAINAGE IMPROVEMENTS	LUMP SUM	1	\$ _____	\$ _____
3	ALABAMA POWER LINE RELOCATES	LUMP SUM	1	\$ 3,810	\$ 3,810

TOTAL AMOUNT BASE BID: \$ _____

Name of Firm or Company Submitting Bid

Date of Bid

Street Address

Tax Id # of Bidder

City State Zip

Web Site of Bidder

Signature of Bidder Representative

Office Ph. # Bidder

Printed Name Representative Executing for Bidder

Cell Ph. # Bidder Contact

Title

Email Address Bidder Rep.

This Bid Response must be notarized.

Sworn to and subscribed before me on this _____ day of _____ 2024.

Notary Public

Commission Expiration Date

SEAL

- * Notes:
1. Please state any Exceptions to the Specifications or other requirements in the Contract Document on a separate sheet and attach that sheet to your Bid Response.
 2. Bidders must complete, sign, notarize and return the Bidder Affidavit and Warranty below with their Responses.
 3. Items 1, and 2 of the Base Bid detailed on EXHIBIT E and on EXHIBIT F.

BIDDER AFFIDAVIT AND WARRANTY

The undersigned warrants, represents and agrees that each of the following is true and correct in connection with its Contractor Bid Response for the Contract to be awarded for the Mountain Ln and Montevallo Ln Area Drainage Improvement Project:

- (a) it has not colluded with any other bidders;
- (b) it has not, directly, or indirectly, induced any other bidder to submit a sham bid or to refrain from making a bid;
- (c) it has not paid or agreed to pay any party, either directly or indirectly, any money or other thing of value for assistance or aid rendered to or to be rendered in attempting to procure the contract contemplated in this bid;
- (d) if the subject contract is awarded to the bidder, no employee or officer of the City has an interest, either direct or indirect, in it or is a beneficiary of the contractual arrangement made the basis thereof.
- (e) all the information contained in the response to the bid is true and correct; and
- (f) the City may rely on information submitted in awarding the subject contract.

Name of Firm or Company Submitting Bid

By: _____
Signature of Bidder Representative

Printed Name: _____

Its: _____
Title

Date: _____

Sworn to and subscribed before me on this ____ day of _____, 2024.

Notary Public

Commission Expiration Date

SEAL

EXHIBIT B - BIDDER QUALIFICATION FORM
MOUNTAIN LN AND MONTEVALLO LN AREA DRAINAGE IMPROVEMENTS

NOTE: THIS FORM MUST BE COMPLETED AND RETURNED WITH YOUR CONTRACTOR BID RESPONSE FORM. IF ADDITIONAL SPACE IS NEEDED, PLEASE STATE THAT INFORMATION ON ADDITIONAL SHEET(S) THAT YOU ATTACH TO THIS FORM AND INDICATE ON THEM THE NUMBER AND ITEM TO WHICH THE INFORMATION CORRESPONDS.

1. Name of Business: _____

Principal Business Address:

2. Business Contact(s)

(a) Primary Contact (Note: If a Pre-Bid Conference is held, the Primary Contact should attend that Conference.)

Name: _____
Title or Position with Company: _____
Day Phone: _____
Email: _____
Street Mailing Address of Contact: _____

(b) Other Business Contact(s)

List the name, position, telephone number, email, and street addresses of persons on the bidder's staff other than the Primary Contact who can answer inquiries and who may attend the pre-bid conference (if any).

3. Business History

(a) How many years has your organization been in the general contracting business? _____

(b) State the facts and attach written documentation evidencing your organization's experience to successfully perform the Project.

(c) How many years has your organization operated under its present business name?

(d) Type of Organization:

(1) If your organization is a corporation, answer the following:

- (i) Date of incorporation: _____
- (ii) State of incorporation: _____
- (iii) President's name: _____
- (iv) Vice-President's name(s) _____
- (v) Secretary's Name _____
- (vi) Treasurer's name: _____

(2) If your organization is a partnership, answer the following:

- (i) Date of organization: _____
- (ii) Type of partnership (if applic.): _____
- (iii) Name(s) of general partner(s) _____

(3) If your organization is individually owned, answer the following:

- (i) Date of organization: _____
- (ii) Name of owner: _____

(e) Administration of Business.

Please describe in general how you operate and administer your business. In this description, please state each of the following:

- (i) the total number of employees;
- (ii) the number of workers who are dedicated to field operations;
- (iii) the name and title of your general supervisor of field service operations; and
- (iv) the number of employees dedicated to administrative and office matters.

4. Licensing.

List and attach to this Form all licenses and certifications that your organization currently holds that authorize it to perform the required Work.

Also please list the License number and attach a copy of the following Licenses to this Form:

- a. State of Alabama General Contractor License
Classification _____
- b. City of Mountain Brook Business License* _____

*Note: If not currently held, Contractor must acquire a City Business License prior to commencing work.

5. Other Similar Projects Performed by Contractor for Governmental Entities.

Below please provide information of all projects of a scope and type comparable to this Project that your organization has successfully performed for governmental entities in the State of Alabama within the last five (5) years. Please provide the following information as to each such project and contract:

Name Governmental Entity: _____
Contact at Entity : _____
Title of Contract: _____
Phone Number: _____
Type(s) of Contract (s): _____
Dates of Contract _____
Location(s) of Service _____

Name Governmental Entity: _____
Contact at Entity : _____
Title of Contract: _____
Phone Number: _____
Type(s) of Contract (s): _____
Dates of Contract _____
Location(s) of Service _____

Name Governmental Entity: _____
Contact at Entity : _____
Title of Contract: _____
Phone Number: _____
Type(s) of Contract (s): _____
Dates of Contract _____
Location(s) of Service _____

Name Governmental Entity: _____
Contact at Entity : _____
Title of Contract: _____
Phone Number: _____
Type(s) of Contract (s): _____
Dates of Contract _____
Location(s) of Service _____

6. List/Qualifications of Project Team.

On a separate page, please list and furnish the following information concerning each of the employees or other representatives whom you will appoint to perform the Project:

- name
- job title
- areas of experience and the length of time for each area
- special training, licensing, and certification for each employee

7. Insurance. If available at this time, please attach a certificate issued by your current Insurance Carrier(s) indicating the existence and limits of your coverage required in Article 37 of the General Conditions of the Contract.

8. Claims History.

(a) Within the last five (5) years, has the bidder, or any officer, director, member or owner of it, been a party to any lawsuit, any arbitration or participated in any other type of alternative dispute resolution process with regard to a claim, dispute, or disagreement arising from the bidder's (or any officer's, director's, member's or such owner's) performance or failure to perform its obligations under an agreement to provide services and conduct operations? (For purposes of this question, an "owner" of the bidder is any person who holds 10% or more of the stock or interest in the bidder organization.) Yes _____ No _____.

If yes, for each such contract or project, explain fully the nature of the project, location, circumstances, your role, and, if resolved, the manner in which any such claim or dispute was resolved:

(b) Within the last five (5) years, has any owner, client or customer of your organization made, asserted, or pursued a claim against a Surety that issued a Performance Bond on a contract that was being performed by the bidder and that arose from its performance or failure to perform obligations under an agreement with that customer to provide services? Yes ____ No _____.

If yes, for each such project, explain fully the nature of the matter, location, circumstances, your role, and, if resolved, the manner in which any Performance Bond claim was resolved:

(c) Within the last five (5) years, have any of your clients or customers formally declared that the bidder is in default or has breached a material obligation in any agreement to provide services or operations? Yes _____ No _____. If yes, for each such project, explain fully the nature of the project, location, circumstances, your role, and, if resolved, the manner in which any such default or breach was resolved:

(d) Has your organization ever failed to complete any work, contract or project awarded to it?

Yes ____ No _____. If yes, please provide all details related to such matter.

(e) Are there any judgments against your organization, or against any of your officers or owners individually, that arise from any litigation or arbitration that have been entered but are not satisfied? Yes ____ No _____.

If yes, please provide all details related to such matter:

(g) Within the last five years, has any officer, principal or owner of your organization ever been an officer or principal of another organization when it failed to complete a contract? (For purposes of this question, an “owner” of the bidder is any person who holds 10% or more of the stock or interest in the bidder.)

Yes ____ No ____ . If yes, please provide all details related to such matter:

CERTIFICATION

The undersigned representative of the Bidder certifies that he/she is authorized to sign below and submit this Bidder Qualification Form on its behalf, and that the information submitted is current, accurate, true, and sufficiently complete so as not to be misleading.

Name of Bidder

(Type or Print)

By: _____
Signature

Printed Name

Its: _____
Title of Authorized Representative

Sworn to and subscribed before me on this ____ day of _____ 2024.

Notary Public

Commission Expiration Date

SEAL

EXHIBIT C - FORM OF CONSTRUCTION CONTRACT

See attached.

CONSTRUCTION CONTRACT

This CONSTRUCTION CONTRACT is entered into this _____ day of _____, 20____ between the **OWNER(s)**,

Entity Name(s): **CITY OF MOUNTAIN BROOK, ALABAMA**
Address(es): 56 Church Street
Mountain Brook, AL 35213
Email(s) & Phone #(s): City Manager: Sam Gaston – gastons@mtnbrook.org
205-802-3803

and the **CONTRACTOR**, _____

Company Name: -----
Address: _____

Email & Phone #: _____

for the **WORK** of the Project (identified as PROJECT):

Mountain Ln and Montevallo Ln Area Drainage Improvements

The **CONTRACT DOCUMENTS** for the PROJECT are as follows (*below list any Supplementary Conditions, Specifications of the Work, Drawings or other Documents that are incorporated into this CONTRACT*):

1. This CONSTRUCTION CONTRACT
2. The GENERAL CONDITIONS OF THE CONTRACT
3. PERFORMANCE BOND
4. LABOR & MATERIALS BOND
5. SUPPLEMENTARY OR TECHNICAL SPECIFICATIONS
6. DRAWINGS & PLANS

and have been amended by the following **ADDENDA** (if applicable):

If applicable, the **ARCHITECT (or ENGINEER)** providing Professional Services for the PROJECT is

Firm Name: Schoel Engineering

Contact at Firm: Mr. Mark E. Simpson

Address of Firm: 1001 22nd Street South, Birmingham, AL 35205

Contact's Email & Phone #: msimpson@schoel.com, (205) 313-1155

The **CONTRACT SUM** is _____ Dollars (\$_____). Unless otherwise indicated, this CONTRACT SUM is the amount of the Contractor's Total Bid for the Work, and, if applicable, the following Bid Alternate Prices:

The **CONTRACT TIME** is 150 calendar days. The Work shall commence on a date to be specified in a Notice to Proceed issued by the Owner, and Contractor then shall substantially complete the Work within the Contract Time.

PROJECT REPRESENTATIVES. The respective PROJECT REPRESENTATIVES of the parties to this CONSTRUCTION CONTRACT are as follows:

Owner Representative

Name: _____

Title: _____

Email & Phone #: _____

Contractor Representative:

Name: _____

Title: _____

Email & Phone #: _____

OWNER AND CONTRACTOR AGREE AS FOLLOWS: The Contract Documents, as defined in the General Conditions of the Contract are incorporated herein by reference. The Contractor shall perform the Work in accordance with the Contract Documents. The Owner will pay the Contract Sum (subject to any additions or deductions for change orders, Liquidated Damages, or other adjustments as provided in the Contract Documents), and Contractor will accept that amount as full compensation for its performance of the Work.

LIQUIDATED DAMAGES. If Contractor does not substantially complete the Work on the PROJECT by the stated Time, the LIQUIDATED DAMAGES for which the Contractor and its Surety (if any) shall be liable and may be required to pay the Owner in accordance with the Contract Documents shall be the dollar amount stipulated in the following space:

Two Hundred Fifty Dollars (\$250) per calendar day.

SPECIAL PROVISIONS

STATE GENERAL CONTRACTOR’S LICENSE: The Contractor hereby certifies that it is currently licensed by the Alabama State Licensing Board for General Contractors and that the certificate for such license bears the following:

License No(s): _____

Classification(s): _____

Bid Limit: _____

(Counterpart Signature Page Follows)

WHEREAS, the undersigned, duly authorized representatives of the respective parties enter this CONSTRUCTION CONTRACT on behalf of their organization.

OWNER - CITY OF MOUNTAIN BROOK, ALABAMA

By: _____

Printed Name: _____

Its: _____

Date: _____

CONTRACTOR

By: _____

Printed Name: _____

Its: _____

Date: _____

EXHIBIT D – GENERAL CONDITIONS OF THE CONTRACT

See attached.

GENERAL CONDITIONS of the CONTRACT

CONTENTS

1. Definitions	25. Owner's Right to Correct Work
2. Intent and Interpretation of the Contract Documents	26. Owner's Right to Stop or Suspend the Work
3. Contractor's Representation	27. Owner's Right to Terminate Contract
4. Documents Furnished to Contractor	28. Contractor's Right to Suspend or Terminate
5. Ownership of Drawings	29. Progress Payments/Retainage
6. Supervision, Superintendent, & Employees	30. Certification & Approvals for Payments
7. Review of Contract Documents and Field Conditions by Contractor	31. Payments Withheld
8. Surveys by Contractor	32. Substantial Completion
9. Submittals	33. Occupancy or Use Prior to Completion
10. Documents and Samples at the Site	34. Final Payment
11. "As-built" Documents	35. Contractor's Warranties of Work
12. Progress Schedule	36. Indemnification Agreement
13. Materials, Equipment & Substitutions	37. Insurance
14. Safety & Protection of Persons & Property	38. Performance and Payment Bonds
15. Hazardous Materials	39. No Assignment without Consent
16. Inspection of the Work	40. Construction by Owner or Separate Contractors
17. Correction of Work	41. Subcontracts
18. Deductions for Uncorrected Work	42. Architect's Status
19. Changes in the Work	43. Cash Allowances
20. Claims for Extra Work	44. Permits, Laws and Regulations/Sales Tax Exemption
21. Differing Site Conditions	45. Royalties, Patents and Copyrights
22. Claims for Damages	46. Use of the Site
23. Delays	47. Cutting and Patching
24. Resolution of Claims and Disputes	48. In-progress and Final Cleanup
	49. Liquidated Damages

ARTICLE 1 DEFINITIONS

Whenever the following terms, or pronouns in place of them, are used in the Contract Documents, the intent and meaning shall be interpreted as follows:

- A. ARCHITECT (OR ENGINEER):** The Architect is the person or entity lawfully licensed to practice architecture in the State of Alabama, who is under contract with the Owner as the primary design professional for the Project and identified as the Architect in the Construction Contract. The term "Architect" means the Architect or the Architect's authorized representative. If the employment of the Architect is terminated, the Owner shall employ a

new Architect whose status under the Contract Documents shall be that of the former Architect. If the primary design professional for the Project is a Professional Engineer, the term “Engineer” shall be substituted for the term “Architect” wherever it appears in this document or other Contract Documents.

Owner will not necessarily retain an Architect (or Engineer) or other professional on each Project. In that event, the Owner’s Project Representative (as designated in the Construction Contract) will primarily interact with the Contractor on matters related to administration of the Contract (including, but not limited to, inspections of the Project site(s), change orders, scheduling and payment of compensation for Work).

B. CONTRACT: The Contract is the embodiment of the Contract Documents. The Contract represents the entire and integrated agreement between the Owner and Contractor and supersedes any prior written or oral negotiations, representations or agreements that are not incorporated into the Contract Documents. The Contract may be amended only by a Contract Change Order or a Modification to the Construction Contract. The contractual relationship which the Contract creates between the Owner and the Contractor extends to no other persons or entities. The Contract consists of the following Contract Documents, including all additions, deletions, and modifications incorporated therein before the execution of the Construction Contract:

- (1) Construction Contract
- (2) General Conditions of the Contract
- (3) Supplementary or Technical Conditions
- (4) Performance and Payment Bonds
- (5) Specifications
- (6) Drawings (or Plans)
- (7) Change Orders
- (8) Addenda or Modifications to the Construction Contract (if applicable to Project)

C. CONTRACT SUM: The Contract Sum is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents. The term “Contract Sum” means the Contract Sum stated in the Construction Contract as may have been increased or decreased by Change Order(s) in accordance with the Contract Documents.

D. CONTRACT TIME: The Contract Time is the period of time in which the Contractor must achieve Substantial Completion of the Work. The date on which the Contract Time begins is specified in the written Notice To Proceed issued to the Contractor by the Owner or Director. The Date of Substantial Completion is the date established in accordance with Article 32. The term “Contract Time” means the Contract Time stated in the Construction Contract as may have been extended by Change Order(s) in accordance with the Contract Documents. The term “day” as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

E. CONTRACTOR: The Contractor is the person or persons, firm, partnership, joint venture, association, corporation, cooperative, limited liability company, or other legal entity,

identified as such in the Construction Contract. The term “Contractor” means the Contractor or the Contractor’s authorized Project Representative.

- F. DEFECTIVE WORK:** The term “Defective Work” shall apply to: (1) any product, material, system, equipment, or service, or its installation or performance, which does not conform to the requirements of the Contract Documents, (2) in-progress or completed Work the workmanship of which does not conform to the quality specified or, if not specified, to the quality produced by skilled workers performing work of a similar nature on similar projects in the state, (3) substitutions and deviations not properly submitted and approved or otherwise authorized, (4) temporary supports, structures, or construction which will not produce the results required by the Contract Documents, and (5) materials or equipment rendered unsuitable for incorporation into the Work due to improper storage or protection.
- G. DRAWINGS:** The Drawings (which may also be referenced as “Plans”) are the portions of the Contract Documents showing graphically the design, location, layout, and dimensions of the Work, in the form of plans, elevations, sections, details, schedules, and diagrams.
- H. NOTICE TO PROCEED:** A proceed order issued by the Owner fixing the date on which the Contractor shall begin the prosecution of the Work, which is also the date on which the Contract Time shall begin.
- I. OWNER:** The Owner is the entity(ies) identified as such in the Construction Contract and is referred to throughout the Contract Documents as if singular in number. The term “Owner” means the Owner or the Owner’s authorized Project Representative. The term “Owner” as used herein shall be synonymous with the term “Awarding Authority” as defined and used in Title 39 - Public Works, Code of Alabama, 1975, as amended.
- J. THE PROJECT:** The Project is the total construction of which the Work required by these Contract Documents, which operations may in their entirety be constructed by the Contractor, or only portions of which the Contractor may construct.
- K. PROJECT MANUAL:** The Project Manual is the volume usually assembled for the Work which may include the Advertisement for Bids, Instructions to Bidders, sample forms, General Conditions of the Contract, Supplementary Conditions, and Specifications of the Work.
- L. SPECIFICATIONS:** The Specifications are that portion of the Contract Documents which set forth in writing the standards of quality and performance of products, equipment, materials, systems, and services and workmanship required for acceptable performance of the Work.
- M. SUBCONTRACTOR:** A Subcontractor is a person or entity who is undertaking the performance of any part of the Work by virtue of a contract with the Contractor. The term “Subcontractor” means a Subcontractor or its authorized representatives.
- N. THE WORK:** The Work is the construction and services required by the Contract Documents and includes all labor, materials, supplies, equipment, and other items, incidentals and services

as are necessary to produce the required construction and to fulfill the Contractor's obligations under the Contract. The Work may constitute the entire Project or only a portion of it.

ARTICLE 2
INTENT and INTERPRETATION of the CONTRACT DOCUMENTS

A. INTENT

It is the intent of the Contract Documents that the Contractor shall properly execute and complete the Work described by the Contract Documents, and unless otherwise provided in the Contract, the Contractor shall provide all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work, in full accordance with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

B. COMPLEMENTARY DOCUMENTS

The Contract Documents are complementary. If Work is required by one Contract Document, the Contractor shall perform the Work as if it were required by all of the Contract Documents. However, the Contractor shall be required to perform Work only to the extent that is consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

C. ORDER of PRECEDENCE

Should any discrepancy arise between the various elements of the Contract Documents, precedence shall be given to them in the following order unless to do so would contravene the apparent Intent of the Contract Documents stated in preceding Paragraph A:

- (1) The Construction Contract.
- (2) Addenda or Modifications to Construction Contract (with those of later date having precedence over those of earlier date).
- (3) Supplementary or Technical Conditions (or other Conditions which modify the General Conditions of the Contract).
- (4) General Conditions of the Contract.
- (5) Specifications.
- (6) Details appearing on the Drawings (or Plans); large scale details shall take precedence over smaller scale details.
- (7) The Drawings (or Plans); large scale drawings shall take precedence over smaller scale drawings.

D. ORGANIZATION

Except as may be specifically stated within the technical specifications, neither the organization of the Specifications into divisions, sections, or otherwise, nor any arrangement of the Drawings shall control how the Contractor may subcontract portions of the Work or assigns Work to any trade.

E. INTERPRETATION

(1) The Contract Documents shall be interpreted collectively, each part complementing the others and consistent with the Intent of the Contract Documents stated in preceding Paragraph A. Unless an item shown or described in the Contract Documents is specifically identified to be furnished or installed by the Owner or others or is identified as “Not In Contract” (“N.I.C.”), the Contractor’s obligation relative to that item shall be interpreted to include furnishing, assembling, installing, finishing, and/or connecting the item at the Contractor’s expense to produce a product or system that is complete, appropriately tested, and in operative condition ready for use or subsequent construction or operation of the Owner or separate contractors. The omission of words or phrases for brevity of the Contract Documents, the inadvertent omission of words or phrases, or obvious typographical or written errors shall not defeat such interpretation as long as it is reasonably inferable from the Contract Documents as a whole.

(2) Words or phrases used in the Contract Documents which have well-known technical or construction industry meanings are to be interpreted consistent with such recognized meanings unless otherwise indicated.

(3) Except as noted otherwise, references to standard specifications or publications of associations, bureaus, or organizations shall mean the latest edition of the referenced standard specification or publication as of the date of the Invitation for Bids.

(4) In the case of inconsistency between Drawings and Specifications or within either document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Architect’s interpretation.

(5) Any portions of the Contract Documents written in longhand must be initialed by all parties.

(6) Any doubt as to the meaning of the Contract Documents or any obscurity as to the wording of them shall be promptly submitted in writing to the Architect for written interpretation, explanation, or clarification.

F. SEVERABILITY.

The partial or complete invalidity of any one or more provision of this Contract shall not affect the validity or continuing force and effect of any other provision.

ARTICLE 3
CONTRACTOR'S REPRESENTATIONS

By executing the Construction Contract the Contractor represents to the Owner:

- A. The Contractor has visited the site of the Work to become familiar with local conditions under which the Work is to be performed and to evaluate reasonably observable conditions as compared with requirements of the Contract Documents.
- B. The Contractor shall use its best skill and attention to perform the Work in an expeditious manner consistent with the Contract Documents.
- C. The Contractor is an independent contractor and in performance of the Contract remains and shall act as an independent contractor having no authority to represent or obligate the Owner in any manner unless authorized by the Owner in writing.

ARTICLE 4
DOCUMENTS FURNISHED to CONTRACTOR

Unless otherwise provided in the Contract Documents, a set of Plans (or Drawings) and Project Manuals will be furnished to the Contractor by the Architect without charge. Other copies requested will be furnished at reproduction cost.

ARTICLE 5
OWNERSHIP of ARCHITECT'S INSTRUMENTS OF SERVICE

All original or duplicated Plans (or Drawings), Specifications, and other documents prepared by the Architect (, and furnished to the Contractor for the Project (the "Instruments of Service") are the property of the Architect and are to be used solely for this Project and not to be used in any manner for other work. Upon completion of the Work, all copies of Drawings and Specifications, with the exception of the Contractor's record set, shall be returned or accounted for by the Contractor to the Architect, on request. Notwithstanding, the Architect has granted Owner a perpetual license to use or reproduce the Instruments of Service for any purposes reasonably related to construction of the Project.

ARTICLE 6
SUPERVISION, SUPERINTENDENT, and EMPLOYEES

A. SUPERVISION and CONSTRUCTION METHODS

- (1) The term "Construction Methods" means the construction means, methods, techniques, sequences, and procedures utilized by the Contractor in performing the Work. The Contractor is solely responsible for supervising and coordinating the performance of the Work, including

the selection of Construction Methods, unless the Contract Documents give other specific instructions concerning these matters.

(2) The Contractor is solely and completely responsible for job site safety, including the protection of persons and property in accordance with Article 14.

(3) The Contractor shall be responsible to the Owner for acts and omissions of not only the Contractor and its agents and employees, but all persons and entities, and their agents and employees, who are performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors.

(4) The Contractor shall be responsible to inspect the in-progress and completed Work to verify its compliance with the Contract Documents and to insure that any element or portion of the Work upon which subsequent Work is to be applied or performed is in proper condition to receive the subsequent Work.

B. SUPERINTENDENT

(1) The Contractor shall employ and maintain a competent level of supervision for the performance of the Work at the Project site, including a superintendent who shall:

- (a) have full authority to receive instructions from the Architect or Owner and to act on those instructions; and
- (b) be present at the Project site at all times during which Work is being performed.

(2) Before beginning performance of the Work, the Contractor shall notify the Architect in writing of the name and qualifications of its proposed superintendent so that the Owner may review the individual's qualifications. If, for reasonable cause, the Owner refuses to approve the individual, or withdraws its approval after once giving it, the Contractor shall name a different superintendent for the Owner's review and approval. Any disapproved superintendent will not perform in that capacity thereafter at the Project site.

C. EMPLOYEES

The Contractor shall permit only fit and skilled persons to perform the Work. The Contractor shall enforce safety procedures, strict discipline, and good order among persons it furnishes to perform the Work. The Contractor will remove from its employment on the Project any person who deliberately or persistently produces non-conforming Work.

ARTICLE 7

REVIEW of CONTRACT DOCUMENTS and FIELD CONDITIONS by CONTRACTOR

A. In order to facilitate assembly and installation of the Work in accordance with the Contract Documents, before starting each portion of the Work, the Contractor shall examine and

compare the relevant Contract Documents, and compare them to relevant field measurements made by the Contractor and any conditions at the site affecting that portion of the Work.

- B.** If the Contractor discovers any errors, omissions, or inconsistencies in the Contract Documents, the Contractor shall promptly report them to the Architect as a written request for information that includes a detailed statement identifying the specific Drawings or Specifications that are in need of clarification and the error, omission, or inconsistency discovered in them.

- (1) The Contractor shall not be expected to act as a licensed design professional and ascertain whether the Contract Documents comply with applicable laws, statutes, ordinances, building codes, and rules and regulations, but the Contractor shall be obligated to promptly notify the Architect of any such noncompliance discovered by or made known to the Contractor. If the Contractor performs Work without fulfilling this notification obligation, the Contractor shall pay the resulting costs and damages that would have been avoided by such notification.

- (2) The Contractor shall not be liable to the Owner for errors, omissions, or inconsistencies that may exist in the Contract Documents, or between the Contract Documents and conditions at the site, unless the Contractor knowingly fails to report a discovered error, omission, or inconsistency to the Architect, in which case the Contractor shall pay the resulting costs and damages that would have been avoided by such notification.

- C.** If the Contractor considers the Architect's response to a request for information to constitute a change to the Contract Documents involving additional costs and/or time, the Contractor shall follow the procedures of Article 20, Claims for Extra Cost or Extra Work.

- D.** If, with undue frequency, the Contractor requests information that is obtainable through reasonable examination and comparison of the Contract Documents, site conditions, and previous correspondence, interpretations, or clarifications, the Contractor shall be liable to the Owner for reasonable charges that may be made it from the Architect for the additional services required to review, research, and respond to such requests for information.

ARTICLE 8
SURVEYS by CONTRACTOR

- A.** The Contractor shall provide competent engineering services to assure accurate execution of the Work in accordance with the Contract Documents. The Contractor shall verify the figures given for the contours, approaches and locations shown on the Drawings before starting any Work and be responsible for the accuracy of the finished Work. Unless furnished by the Owner or agreed by the parties, without extra cost to the Owner, the Contractor shall engage a licensed surveyor to identify boundary lines; in any event, Contractor shall be responsible

to take necessary actions to verify that its operations are conducted within boundary and property lines, and shall be responsible for encroachments on rights or property of public or surrounding property owners.

- B.** The Contractor shall establish all base lines for the location of the principal components of the Work and make all detail surveys necessary for construction, including grade stakes, batter boards and other working points, lines and elevations. If the Work involves alteration of or addition to existing structures or improvements, the Contractor shall locate and measure elements of the existing conditions as is necessary to facilitate accurate fabrication, assembly, and installation of new Work in the relationship, alignment, and/or connection to the existing structure or improvement as is shown in the Contract Documents.

ARTICLE 9
SUBMITTALS

- A.** Where required by the Contract Documents, the Contractor shall submit shop drawings, product data, samples and other information (hereinafter referred to as Submittals) to the Architect for the purpose of demonstrating the way by which the Contractor proposes to conform to the requirements of the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect without action.
- B.** The Contractor shall be responsible to the Owner for the accuracy of its Submittals and the conformity of its submitted information to the requirements of the Contract Documents. Each Submittal shall bear the Contractor's approval, evidencing that the Contractor has reviewed and found the information to be in compliance with the requirements of the Contract Documents. Submittals which are not marked as reviewed and approved by the Contractor may be returned by the Architect without action.
- C.** The Contractor shall prepare and deliver its submittals to the Architect sufficiently in advance of construction requirements and in a sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. In coordinating the Submittal process with its construction schedule, the Contractor shall allow sufficient time to permit adequate review by the Architect.
- D.** By approving a Submittal the Contractor represents not only that the element of Work presented in the Submittal complies with the requirements of the Contract Documents, but also that the Contractor has:
 - (1) found the layout and/or dimensions in the Submittal to be comparable with those in the Contract Documents and other relevant Submittals and has made field measurements as necessary to verify their accuracy, and
 - (2) determined that products, materials, systems, equipment and/or procedures presented in the Submittal are compatible with those presented, or being presented, in other relevant Submittals and with the Contractor's intended Construction Methods.

- E. The Contractor shall not fabricate or perform any portion of the Work for which the Contract Documents require Submittals until the respective Submittals have been approved by the Architect.
- F. In the case of a resubmission, the Contractor shall direct specific attention to all revisions in a Submittal. The Architect's approval of a resubmission shall not apply to any revisions that were not brought to the Architect's attention.
- G. If the Contract Documents specify that a Submittal is to be prepared and sealed by a registered architect or licensed engineer retained by the Contractor, all drawings, calculations, specifications, and certifications of the Submittal shall bear the Alabama seal of registration and signature of the registered/licensed design professional who prepared them or under whose supervision they were prepared. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of such a Submittal, provided that all performance and design criteria that such Submittal must satisfy are sufficiently specified in the Contract Documents. The Architect will review, approve or take other appropriate action on such a Submittal only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance or design criteria specified in the Contract Documents.

H. DEVIATIONS

(1) The Architect is authorized by the Owner to approve "minor" deviations from the requirements of the Contract Documents. "Minor" deviations are defined as those which are in the interest of the Owner, do not materially alter the quality or performance of the finished Work, and do not affect the cost or time of performance of the Work. Deviations which are not "minor" may be authorized only by the Owner through the Change Order procedures of Article 19.

(2) Any deviation from the requirements of the Contract Documents contained in a Submittal shall be clearly identified as a "Deviation from Contract Requirements" (or by similar language) within the Submittal and, in a letter transmitting the Submittal to the Architect, the Contractor shall direct the Architect's attention to, and request specific approval of, the deviation. Otherwise, the Architect's approval of a Submittal does not constitute approval of deviations from the requirements of the Contract Documents contained in the Submittal.

(3) The Contractor shall bear all costs and expenses of any changes to the Work, changes to work performed by the Owner or separate contractors, or additional services by the Architect required to accommodate an approved deviation unless the Contractor has specifically informed the Architect in writing of the required changes and a Change Order has been issued authorizing the deviation and accounting for such resulting changes and costs.

I. ARCHITECT'S REVIEW and APPROVAL

(1) The Architect will review the Contractor's Submittals for conformance with requirements of, and the design concept expressed in, the Contract Documents and will approve or take other appropriate action upon them. This review is not intended to verify the accuracy and completeness of details such as dimensions and quantities nor to substantiate installation instructions or performance of equipment or systems, all of which remain the responsibility of the Contractor. However, the Architect shall advise the Contractor of any errors or omissions which the Architect may detect during this review. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

(2) The Architect will review and respond to all Submittals with reasonable promptness to avoid delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time to permit adequate review.

(3) No corrections or changes to Submittals indicated by the Architect will be considered as authorizations to perform Extra Work. If the Contractor considers such correction or change of a Submittal to require Work which differs from the requirements of the Contract Documents, the Contractor shall promptly notify the Architect in writing in accordance with Article 20, Claims for Extra Cost or Extra Work.

J. CONFORMANCE with SUBMITTALS

The Work shall be constructed in accordance with approved Submittals.

ARTICLE 10
DOCUMENTS and SAMPLES at the SITE

A. "AS ISSUED" SET

The Contractor shall maintain at the Project site, in good order, at least one copy of all Addenda, Change Orders, supplemental drawings, written directives and clarifications, and approved Submittals intact as issued, and an updated construction schedule.

B. "POSTED" SET

The Contractor shall maintain at the Project site, in good order, at least one set of the Drawings and Project Manual into which the Contractor has "posted"(incorporated) all Addenda, Change Orders, supplemental drawings, clarifications, and other information pertinent to the proper performance of the Work. The Contractor shall assure that all sets of the Drawings and Project Manuals being used by the Contractor, Subcontractors, and suppliers are "posted" with the current information to insure that updated Contract Documents are used for performance of the Work.

C. RECORD SET

One set of the Drawings and Project Manual described in Paragraph B shall be the Contractor's record set in which the Contractor shall record all field changes, corrections, selections, final locations, and other information as will be duplicated on the "As-built" documents required under Article 11. The Contractor shall record such "as-built" information in its record set as it becomes available through progress of the Work. The Contractor's performance of this requirement shall be subject to confirmation by the Architect at any time as a prerequisite to approval of Progress Payments.

- D.** The documents and samples required by this Article to be maintained at the Project site shall be readily available to the Architect, Owner and their representatives.

ARTICLE 11
"AS-BUILT" DOCUMENTS

- A.** Unless otherwise provided in the Contract Documents, the Contractor shall deliver two (2) sets of "As-built" documents, as described herein, to the Architect for submission to the Owner upon completion of the Work. Each set of "As-built" documents shall consist of a copy of the Drawings and Project Manual, in like-new condition, into which the Contractor has neatly incorporated all Addenda, Change Orders, supplemental drawings, clarifications, field changes, corrections, selections, actual locations of underground utilities, and other information as required herein or specified elsewhere in the Contract Documents.
- B.** The Contractor shall use the following methods for incorporating information into the "As-built" documents:

(1) Drawings

- (a) To the greatest extent practicable, information shall be carefully drawn and lettered, in ink, on the Drawings in the form of sketches, details, plans, notes, and dimensions as required to provide a fully dimensioned record of the Work. When required for clarity, sketches, details, or partial plans shall be drawn on supplemental sheets and bound into the Drawings and referenced on the drawing being revised.
- (b) Where a revised drawing has been furnished by the Architect, the drawing of latest date shall be bound into the Drawings in the place of the superseded drawing.
- (c) Where a supplemental drawing has been furnished by the Architect, the supplemental drawing shall be bound into the Drawings in an appropriate location and referred to by notes added to the drawing being supplemented.
- (d) Where the Architect has furnished details, partial plans, or lengthy notes of which it would be impractical for the Contractor to redraw or letter on a drawing, such information may be affixed to the appropriate drawing with transparent tape if space is available on the drawing.
- (e) Any entry of information made in the Drawings that is the result of an Addendum or Change Order, shall identify the Addendum or Change Order from which it originated.

(2) Project Manual

- (a) A copy of all Addenda and Change Orders, excluding drawings thereof, shall be bound in the front of the Project Manual.
 - (b) Where a document, form, or entire specification section is revised, the latest issue shall be bound into the Project Manual in the place of the superseded issue.
 - (c) Where information within a specification section is revised, the deleted or revised information shall be drawn through in ink and an adjacent note added identifying the Addendum or Change Order containing the revised information.
- C. Within ten days after the Date of Substantial Completion of the Work, or the last completed portion of the Work, the Contractor shall submit the “As-built” documents to the Architect for approval. If the Architect requires that any corrections be made, the documents will be returned in a reasonable time for correction and resubmission.

ARTICLE 12
PROGRESS SCHEDULE

(Not applicable if the Contract Time is 60 days or less.)

- A. The Contractor shall within fifteen days after the date of commencement stated in the Notice to Proceed, or such other time as may be provided in the Contract Documents, prepare and submit to the Architect for review and approval a practicable construction schedule informing the Architect and Owner of the order in which the Contractor plans to carry on the Work within the Contract Time. The Architect’s review and approval of the Contractor’s construction schedule shall be only for compliance with the specified format, Contract Time, and suitability for monitoring progress of the Work and shall not be construed as a representation that the Architect has analyzed the schedule to form opinions of sequences or durations of time represented in the schedule.
- B. If a schedule format is not specified elsewhere in the Contract Documents, the construction schedule shall be prepared using a customary format of suitable scale and detail to indicate the percentage of Work scheduled to be completed at the end of each month. At the end of each month the Contractor shall enter the actual percentage of completion on the construction schedule submit two copies to the Architect, and attach one copy to each copy of the monthly Application for Payment. The construction schedule shall be revised to reflect any agreed extensions of the Contract Time or as required by conditions of the Work.
- C. The Contractor’s construction schedule shall be used by the Contractor, Architect, and Owner to determine the adequacy of the Contractor’s progress. The Contractor shall be responsible for maintaining progress in accordance with the currently approved construction schedule and shall increase the number of shifts, and/or overtime operations, days of work, and/or the amount of construction plant and equipment as may be necessary to do so. If the Contractor’s progress falls materially behind the currently approved construction schedule and, in the opinion of the Architect or Owner, the Contractor is not taking sufficient steps to regain schedule, the Architect may, with the Owner’s concurrence, issue the Contractor a Notice to Cure pursuant to Article 27. In such a Notice to Cure the Architect may require the Contractor

to submit such supplementary or revised construction schedules as may be deemed necessary to demonstrate the manner in which schedule will be regained.

ARTICLE 13
EQUIPMENT, MATERIALS, and SUBSTITUTIONS

- A. Every part of the Work shall be executed in a workmanlike manner in accordance with the Contract Documents and approved Submittals. All materials used in the Work shall be furnished in sufficient quantities to facilitate the proper and expeditious execution of the Work and shall be new, unused and of recent manufacture, except such materials as may be expressly provided or allowed in the Contract Documents to be otherwise.
- B. Whenever a product, material, system, item of equipment, or service is identified in the Contract Documents by reference to a trade name, manufacturer's name, model number, etc.(hereinafter referred to as "source"), and only one or two sources are listed, or three or more sources are listed and followed by "or approved equal" or similar wording, it is intended to establish a required standard of performance, design, and quality, and the Contractor may submit, for the Architect's approval, products, materials, systems, equipment, or services of other sources which the Contractor can prove to the Architect's satisfaction are equal to, or exceed, the standard of performance, design and quality specified, unless the provisions of Paragraph D below apply. Such proposed substitutions are not to be purchased or installed without the Architect's written approval of the substitution.
- C. If the Contract Documents identify three or more sources for a product, material, system, item of equipment or service to be used and the list of sources is not followed by "or approved equal" or similar wording, the Contractor may make substitution only after evaluation by the Architect and execution of an appropriate Contract Change Order.
- D. If the Contract Documents identify only one source and expressly provide that it is an approved sole source for the product, material, system, item of equipment, or service, the Contractor must furnish the identified sole source.

ARTICLE 14
SAFETY and PROTECTION of PERSONS and PROPERTY

- A. The Contractor shall be solely and completely responsible for conditions at the Project site, including safety of all persons (including employees) and property. The Contractor shall create, maintain, and supervise conditions and programs to facilitate and promote safe execution of the Work, and shall supervise the Work with the attention and skill required to assure its safe performance. Safety provisions shall conform to OSHA requirements and all other federal, state, county, and local laws, ordinances, codes, and regulations. Where any of these are in conflict, the more stringent requirement shall be followed. Nothing contained in this Contract shall be construed to mean that the Owner has employed the

Architect nor has the Architect employed its consultants to administer, supervise, inspect, or take action regarding safety programs or conditions at the Project site.

- B.** The Contractor shall employ Construction Methods, safety precautions, and protective measures that will reasonably prevent damage, injury or loss to:
- (1) workers and other persons on the Project site and in adjacent and other areas that may be affected by the Contractor's operations;
 - (2) the Work and materials and equipment to be incorporated into the Work and stored by the Contractor on or off the Project site; and
 - (3) other property on, or adjacent to, the Project site, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and other improvements not designated in the Contract Documents to be removed, relocated, or replaced.
- C.** The Contractor shall be responsible for the prompt remedy of damage and loss to property, including the filing of appropriate insurance claims, caused in whole or in part by the fault or negligence of the Contractor, a Subcontractor, or anyone for whose acts they may be liable.
- D.** The Contractor shall comply with and give notices required by applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety and protection of persons or property, including without limitation notices to adjoining property owners of excavation or other construction activities that potentially could cause damage or injury to adjoining property or persons thereon.
- E.** The Contractor shall erect and maintain barriers, danger signs, and any other reasonable safeguards and warnings against hazards as may be required for safety and protection during performance of the Contract, and shall notify owners and users of adjacent sites and utilities of conditions that may exist or arise which may jeopardize their safety.
- F.** If use or storage of explosives or other hazardous materials or equipment or unusual Construction Methods are necessary for execution of the Work, the Contractor shall exercise commensurate care and employ supervisors and workers properly qualified to perform such activity.
- G.** The Contractor shall furnish a qualified safety representative at the Project site whose duties shall include the prevention of accidents. The safety representative shall be the Contractor's superintendent, unless the Contractor assigns this duty to another responsible member of its on-site staff and notifies the Owner and Architect in writing of such assignment.
- G.** The Contractor shall not permit a load to be applied, or forces introduced, to any part of the construction or site that may cause damage to the construction or site or endanger safety of the construction, site, or persons on or near the site.

- H. The Contractor shall have the right to act as it deems appropriate in emergency situations jeopardizing life or property. The Contractor shall be entitled to equitable adjustment of the Contract Sum or Contract Time for its efforts expended for the sole benefit of the Owner in such an emergency. Such adjustment shall be determined as provided in Articles 19 and 20.
- I. The duty of the Architect (and its consultants) under any professional services agreement between them and the Owner to visit the Project site to conduct periodic inspections of the Work or for other purposes shall not give rise to a duty to review or approve the adequacy of the Contractor's safety program, safety supervisor, or any safety measure which Contractor takes or fails to take in, on, or near the Project site, or for the Architect to undertake any of Contractor's other obligations to the Owner under the Contract for the Project.

ARTICLE 15
HAZARDOUS MATERIALS

- A. A Hazardous Material is any substance or material identified as hazardous under any federal, state, or local law or regulation, or any other substance or material which may be considered hazardous or otherwise subject to statutory or regulatory requirements governing its handling, disposal, and/or remediation. Existing Hazardous Materials are Hazardous Materials discovered at the Project site and not introduced to the Project site by the Contractor, a Subcontractor, or anyone for whose acts they may be liable.
- B. If, during the performance of the Work, the Contractor encounters a suspected Existing Hazardous Material, the Contractor shall immediately stop work in the affected area, take measures appropriate to the condition to keep people away from the suspected Existing Hazardous Material, and immediately notify the Architect and Owner of the condition in writing.
- C. The Owner has multiple options upon receiving notice from the Contractor of the existence of Hazardous Materials at the Project site. First, it may obtain the services of an independent laboratory or professional consultant, appropriately licensed and qualified, to determine whether the suspected material is a Hazardous Material requiring abatement and, if so, to certify after its abatement that it has been rendered harmless. Any abatement of Existing Hazardous Materials will be the responsibility of the Owner. The Owner will advise the Contractor in writing of the persons or entities who will determine the nature of the suspected material and those who will, if necessary, perform the abatement. The Owner will not employ persons or entities to perform these services to whom the Contractor or Architect has reasonable objection.

Alternatively, the Owner, in the exercise of its discretion, may elect to terminate the Contract and not proceed with construction of the Project. If Owner elects such termination option, Contractor will be compensated for all work and reasonable expenses performed by it up to the time of termination.

- D. After certification by the Owner's independent laboratory or professional consultant that the material is harmless or has been rendered harmless, work in the affected area shall resume

upon written agreement between the Owner and Contractor. If the material is found to be an Existing Hazardous Material and the Contractor incurs additional cost or delay due to the presence and abatement of the material, the Contract Sum and/or Contract Time shall be appropriately adjusted by a Contract Change Order pursuant to Article 19.

- E. The Owner shall not be responsible for Hazardous Materials introduced to the Project site by the Contractor, a Subcontractor, or anyone for whose acts they may be liable, unless such Hazardous Materials were required by the Contract Documents; provided that, if such Hazardous Materials are required by the Contract Documents to be used by Contractor on the site, Contractor shall at all times exclusively be responsible to utilize practices and procedures required by applicable environmental laws and regulations for storage and maintenance of those Materials on the site during the Project and shall remove them therefrom following the completion of Work.

ARTICLE 16 **INSPECTION of the WORK**

A. GENERAL

(1) The Contractor is solely responsible for the Work's compliance with the Contract Documents. Accordingly the Contractor shall inspect in-progress and completed Work, and shall verify its compliance with those Documents and that any element or portion of the Work upon which subsequent Work is to be applied.

Neither the presence nor absence of inspections by the Architect, Owner, any public authority having jurisdiction (or their representatives) shall relieve the Contractor of its responsibilities to inspect the Work and utilize appropriate Construction Methods and safety precautions and programs in connection with the Work, or from any other requirement of the Contract Documents.

(2) The Architect, Owner, any public authority having jurisdiction, and their representatives shall have access at all times to the Work for inspection whenever it is in progress, and the Contractor shall provide proper facilities for such access and inspection. All materials, workmanship, processes of manufacture, and methods of construction, if not otherwise stipulated in the Contract Documents, shall be subject to inspection, examination, and test at any and all places where such manufacture and/or construction are being carried on. Such inspections will not unreasonably interfere with the Contractor's operations.

(3) The Architect will inspect the Work as a representative of the Owner.

(4) The following understandings apply with respect to any inspections of the Work by the Architect (or Engineer) or City Project Representative:

(a) During the course of Contractor's operations, the Architect (or Engineer) or Owner Project Representative may, but is not obligated to, inspect phases of the Work in progress and provide input to the Contractor Project Representative on the following matters: the quality and acceptability of materials furnished; rate of progress of the work; sequence of construction; interpretation of Plans and Specifications; compensation; and suspension of Work if determined by the City representative to be required for public convenience. No such inspection by any of them or the provision of any such input will excuse Contractor from its failure to comply with the Contract, or relieve it from its responsibilities thereunder to supervise the Work, to fully supervise all its employees and representatives, or to perform the Work in compliance with the Specifications and other Contract Documents. Furthermore, no inspection by the Architect (or Engineer) or Owner Project Representative shall be construed to constitute the assumption by the Owner of any of Contractor's contractual duties.

(b) Contractor shall furnish the Architect (or Engineer) or City Project Representative with reasonable and access facility to ascertain whether the Work as performed is in accordance with the Specifications. Should any work be covered or hidden prior to the approval thereof, it shall be uncovered for examination at the Contractor's expense.

(5) The Contractor may be charged by the Owner for any extra cost of inspection incurred by the Architect or Owner on account of material and workmanship not being ready at the time of inspection set by the Contractor.

B. TYPES of INSPECTIONS

(1) **SCHEDULED INSPECTIONS and CONFERENCES.** Scheduled Inspections and Conferences shall be conducted by the Architect, scheduled by it in coordination with the Contractor Superintendent, and attended by the Contractor and applicable Subcontractors, suppliers and manufacturers. Scheduled Inspections and Conferences for this Contract may include:

(a) **Pre-Construction Conference.**

(b) **Pre-roofing Conference** (inapplicable if the Contract does not involve roofing work)

(c) **Above Ceiling Inspection(s)** (if applicable): An above ceiling inspection of all spaces in the building is required before the ceiling material is installed. Above ceiling inspections are to be conducted at a time when all above ceiling systems are complete and tested to the greatest extent reasonable pending installation of the ceiling material. System identifications and markings are to be complete. All fire-rated construction including fire-stopping of penetrations and specified identification above the ceiling shall be complete. Ceiling framing and suspension systems shall be complete with lights, grilles and diffusers, access panels, fire protection drops for sprinkler heads, etc., installed in their final locations to the greatest extent reasonable. Above ceiling framing to support ceiling mounted equipment shall be complete. The above ceiling

construction shall be complete to the extent that after the inspection the ceiling material can be installed without disturbance.

(d) **Final Inspection(s):** A Final Inspection shall establish that the Work, or a designated portion of the Work, is Substantially Complete in accordance with Article 32 and is accepted by the Architect and Owner as being ready for the Owner's occupancy or use. At the conclusion of this Final Inspection, items requiring correction or completion ("punch list" items) shall be minimal and require only a short period of time for accomplishment to establish Final Acceptance of the Work. If the Work, or designated portion of the Work, includes the installation, or modification, of a fire alarm system or other life safety systems essential to occupancy, such systems shall have been tested and appropriately certified before the Final Inspection.

(e) **Year-end Inspection(s):** An inspection of the Work, or each separately completed portion thereof, is required near the end of the Contractor's one-year warranty period(s) for the Work. The subsequent delivery of the Architect's report of this Year End Inspection will serve as confirmation that the Contractor was notified of Defective Work found within the warranty period in accordance with Article 35.

(2) **PERIODIC INSPECTIONS.** Periodic Inspections may be conducted throughout the course of the Work by the Architect, the Architect's consultants, the Owner and their representatives, jointly or independently, with or without advance notice to the Contractor.

(3) **SPECIFIED INSPECTIONS and TESTS.** Specified Inspections and Tests include inspections, tests, demonstrations, and approvals that are either specified in the Contract Documents or required by laws, ordinances, rules, regulations, or orders of public authorities having jurisdiction, to be performed by the Contractor, one of its Subcontractors, or an independent testing laboratory or firm (whether paid for by the Contractor or Owner).

C. INSPECTIONS by the ARCHITECT

(1) The Architect is not authorized to revoke, alter, relax, or waive any requirements of the Contract Documents (other than "minor" deviations as defined in Article 9 and "minor" changes as defined in Article 19), to finally approve or accept any portion of the Work or to issue instructions contrary to the Contract Documents without concurrence of the Owner.

(2) The Architect will visit the site at intervals appropriate to the stage of the Contractor's operations and as otherwise necessary to:

- (a) become generally familiar with the in-progress and completed Work and the quality of the Work,
- (b) determine whether the Work is progressing in general accordance with the Contractor's schedule and is likely to be completed within the Contract Time,
- (c) visually compare readily accessible elements of the Work to the requirements of the Contract Documents to determine, in general, if the Contractor's performance of the Work will conform to the requirements of the Contract Documents when completed,
- (d) endeavor to guard the Owner against Defective Work,

- (e) review and address with the Contractor any problems in implementing the requirements of the Contract Documents that the Contractor may have encountered, and
- (f) keep the Owner fully informed about the Project.

(3) The Architect shall have the authority to reject Defective Work or require its correction, and may, but shall not be required, to make exhaustive investigations or examinations of the in-progress or completed portions of the Work to expose the presence of Defective Work. However, the Architect shall report, in writing, to the Owner and Contractor any Defective Work recognized by the Architect.

(4) The Architect shall have the authority to require the Contractor to stop work only when, in the Architect's reasonable opinion, such stoppage is necessary to avoid Defective Work. The Architect shall not be liable to the Contractor or Owner for the consequences of any decisions made by the Architect in good faith either to exercise or not to exercise this authority.

(5) "Inspections by the Architect" includes appropriate inspections by the Architect's consultants as dictated by their respective disciplines of design and the stage of the Contractor's operations.

E. UNCOVERING WORK

(1) If the Contractor covers a portion of the Work before it is examined by the Architect and this is contrary to the Architect's request or specific requirements in the Contract Documents, then, upon written request of the Architect, the Work must be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

(2) Without a prior request or specific requirement that Work be examined by the Architect before it is covered, the Architect may request that Work be uncovered for examination and the Contractor shall uncover it. If the Work is in accordance with the Contract Documents, the Contract Sum shall be equitably adjusted under Article 19 to compensate the Contractor for the costs of uncovering and replacement. If the Work is not in accordance with the Contract Documents, uncovering, correction, and replacement shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

F. SPECIFIED INSPECTIONS and TESTS

(1) The Contractor shall schedule and coordinate Specified Inspections and Tests to be made at appropriate times so as not to delay the progress of the Work or the work of the Contractor or separate contractors. If the Contract Documents require that a Specified Inspection or Test be witnessed or attended by the Architect or Architect's consultant, the Contractor shall give the Architect timely notice of the time and place of the Specified Inspection or Test. If a Specified Inspection or Test reveals that Work is not in compliance with requirements of the Contract Documents, the Contractor shall bear the costs of correction, repeating the Specified Inspection or Test, and any related costs incurred by the

Owner, including reasonable charges, if any, by the Architect for additional services. Through appropriate Contract Change Order, the Owner shall bear costs of tests, inspections or approvals which become Contract requirements subsequent to the receipt of bids.

(2) If the Architect, Owner, or any other public authority having jurisdiction of the Project determines that inspections, tests, demonstrations, or approvals in addition to Specified Inspections and Tests are required, the Contractor shall, upon written instruction from the Architect, arrange for their performance by an entity acceptable to the Owner, giving timely notice to the Architect of the time and place of their performance. Related costs of these additional tests shall be borne by the Owner unless the procedures reveal that Work is not in compliance with requirements of the Contract Documents, in which case the Contractor shall bear the costs of correction, repeating the procedures, and any related costs incurred by the Owner, including reasonable charges, if any, by the Architect for additional services.

(3) Unless otherwise required by the Contract Documents, required certificates of Specified Inspections and Tests shall be secured by the Contractor and promptly delivered to the Architect.

(4) Failure of any materials to pass Specified Inspections and Tests will be sufficient cause for refusal to consider any further samples of the same brand or make of that material for use in the Work.

ARTICLE 17
CORRECTION of DEFECTIVE WORK

- A. The Contractor shall, at its expense, promptly correct Defective Work rejected by the Architect or which otherwise becomes known to the Contractor, removing the rejected or nonconforming materials and construction from the project site.
- B. Correction of Defective Work shall be performed in such a timely manner as will avoid delay of completion, use, or occupancy of the Work and the work of the Owner and separate contractors.
- C. The Contractor shall bear all expenses related to the correction of Defective Work, including but not limited to: (1) additional testing and inspections, including repeating Specified Inspections and Tests, (2) reasonable services and expenses of the Architect, and (3) the expense of restoring all work of the Contractor, Owner, or separate contractors destroyed or damaged by the correction of Defective Work.

ARTICLE 18
DEDUCTIONS for UNCORRECTED WORK

If the Owner deems it is advisable and in its interest to accept Defective Work, the Owner may allow part or all of such Work to remain in place, provided that Owner and Contractor agree on an amount equitable deduction from the Contract Sum related to that Defective Work.

ARTICLE 19
CHANGES in the WORK

A. GENERAL

- (1) The Owner reserves the right at any time to direct the Contractor to make changes in the Work which are within the general scope of the Contract, including changes in the Drawings, Specifications, or other portions of the Contract Documents to add, delete, or otherwise revise portions of the Work. The Architect may written order to the Contractor that “minor” changes in the Work be performed “Minor” changes in the Work are defined as those which are in the interest of the Owner, do not materially alter the quality or performance of the finished Work, and do not affect or modify the Contract Sum or time of performance (i.e. Contract Time) of the Work. If the changes requested by Owner are not “minor” or materially affect the Specifications or general nature of the Work as whole, they may be the basis for an adjustment of the Contract Time or Contract Sum as provided in this Article.
- (2) If the Owner directs a change in the Work, the change shall be incorporated into the Contract by a Contract Change Order prepared by the Architect and signed by the Contractor, Owner, and other signatories to the Construction Contract, stating their agreement upon the change or changes in the Work and the adjustments, if any, in the Contract Sum and the Contract Time.
- (3) Subject to compliance with Alabama’s Public Works Law, the Owner may, upon agreement by the Contractor, incorporate previously unawarded bid alternates into the Contract.
- (4) In the event of a claim or dispute as to the appropriate adjustment to the Contract Sum or Contract Time due to a directive to make changes in the Work, the Work shall proceed as provided in this Article subject to subsequent agreement of the parties or final resolution of the dispute pursuant to Article 24.
- (5) Consent of Surety will be obtained for all Contract Change Orders involving an increase in the Contract Sum.
- (6) Changes in the Work shall be performed under applicable provisions of the Contract Documents and the Contractor shall proceed promptly to perform changes in the Work, unless otherwise directed by the Owner through the Architect.

(7) All change orders will be documented on forms acceptable to the Contractor, Architect and Owner.

B. DETERMINATION of ADJUSTMENT of the CONTRACT SUM

If appropriate, the adjustment of the Contract Sum resulting from a change in the Work may be determined by one of the following methods, or a combination thereof, as selected by the Owner:

(1) **Lump Sum Method** - by mutual agreement on a lump sum based on or negotiated from an itemized cost proposal from the Contractor. Additions to the Contract Sum shall include the Contractor's direct costs plus a maximum 10% markup for overhead and profit. Where the change order involves subcontract work is involved the total mark-up for the Contractor and a Subcontractor shall not exceed 15%. **Changes which involve a deductive change order shall include a net credit to the Owner for overhead and profit on the deducted work in no case less than 5%.** For the purposes of this method of determining an adjustment of the Contract Sum, "overhead" shall cover the Contractor's indirect costs of the change, such as the cost of bonds, superintendent and other job office personnel, watchman, job office, job office supplies and expenses, temporary facilities and utilities, and home office expenses.

(2) **Unit Price Method** - by applying Unit Prices included in the Contract or subsequently agreed to by the parties. However, if the character or quantity originally contemplated is materially changed so that application of such unit price to quantities of Work proposed will cause substantial inequity to either party, the applicable unit price shall be equitably adjusted.

(3) **Force Account Method** - by directing the Contractor to proceed with the change in the Work on a "force account" basis under which the Contractor shall be reimbursed for reasonable expenditures incurred by the Contractor and its Subcontractors in performing added Work and the Owner shall receive reasonable credit for any deleted Work. The Contractor shall keep and present, in such form as the Owner may prescribe, an itemized accounting of the cost of the change together with sufficient supporting data. Unless otherwise stated in the directive, this method of adjustment of the Contract Sum shall be limited to the following:

- (a) costs of labor and supervision, including employee benefits, social security, retirement, unemployment and workers' compensation insurance required by law, agreement, or under Contractor's or Subcontractor's standard personnel policy;
- (b) cost of materials, supplies and equipment, including cost of delivery, whether incorporated or consumed;
- (c) rental cost of machinery and equipment, not to exceed prevailing local rates if contractor-owned;
- (d) costs of premiums for insurance required by the Contract Documents, permit fees, and sales, use or similar taxes related to the change in the Work;

- (e) reasonable credits to the Owner for the value of deleted Work, without Contractor or Subcontractor mark-ups; and
- (f) for additions to the Contract Sum, mark-up of the Contractor's direct costs for overhead and profit not exceeding 10% on Contractor's work nor exceeding 15% for Contractor and Subcontractor on a Subcontractor's work. **Changes which involve a deduction to the Contract sum and involve a net credit to the Owner shall include fair and reasonable credits for overhead and profit on the deducted work in no case less than 5%.** For the purposes of this method of determining an adjustment of the Contract Sum, "overhead" shall cover the Contractor's indirect costs of the change, such as the cost of insurance other than mentioned above, bonds, superintendent and other job office personnel, watchman, use and rental of small tools, job office, job office supplies and expenses, temporary facilities and utilities, and home office expenses.

C. ADJUSTMENT of the CONTRACT TIME for CHANGES REQUESTED BY OWNER

(1) Unless otherwise provided in the Contract Documents, excepting Minor changes within the meaning of Article 19, the Contract Time shall be equitably adjusted for the performance of a change in the requirements of the Project that is requested by Owner. If Contractor determines that implementation of that change will increase the time for performance of the entire Work, it shall notify Architect of that determination and provide the following in its notice to Architect:

- (a) the number of days of extension requested by Contractor;
- (b) any cost proposal of Contractor associated with the material requested change;
- and
- (c) if Contractor receives a directive to proceed with the change in advance of submitting a cost proposal, Contractor shall give the notice within 10 days after completing the change along with an estimated number of days of extension, which may be subject to adjustment in the cost proposal.

(2) The Contract Time shall be extended only to the extent that the change requested by the Owner affects the time required to complete the entire Work of the Contract, taking into account the concurrent performance of the changed and unchanged Work.

D. CHANGE ORDER PROCEDURES

(1) If the Owner proposes to make a change in the Work that affects the Contract Sum, the Architect will request that the Contractor provide a cost proposal for making that change. The request shall be in writing and shall adequately describe the proposed change using drawings, specifications, narrative, or a combination thereof. Within 21 days after receiving such a request, or such other time as may be stated in the request, the Contractor shall prepare and submit to the Architect a written proposal, properly itemized and supported by sufficient

substantiating data to facilitate evaluation. The stated time within which the Contractor must submit a proposal may be extended if, within that time, the Contractor makes a written request with reasonable justification thereof.

(2) The Contractor may voluntarily offer a change proposal which, in the Contractor's opinion, will reduce the cost of construction, maintenance, or operation or will improve the cost-effective performance of an element of the Project, in which case the Owner, through the Architect, will accept, reject, or respond otherwise within 21 days after receipt of the proposal, or such other reasonable time as the Contractor may state in the proposal.

(3) If the Contractor's proposal is acceptable to the Owner, or is negotiated to the mutual agreement of the Contractor and Owner, the Architect will prepare an appropriate Contract Change Order for execution. Upon receipt of the fully executed Contract Change Order, the Contractor shall proceed with the change.

(4) In advance of delivery of a fully executed Contract Change Order, the Architect may furnish to the Contractor a written authorization to proceed with an agreed change. However, such an authorization shall be effective only if it:

- (a) identifies the Contractor's accepted or negotiated proposal for the change,
- (b) states the agreed adjustments, if any, in Contract Sum and Contract Time,
- (c) states that funds are available to pay for the change, and
- (d) is signed by the Owner.

(5) If the Contractor and Owner cannot agree on the amount of the adjustment in the Contract Sum for a change, the Owner, through the Architect, may order the Contractor to proceed with the change on a Force Account basis, but the net cost to the Owner shall not exceed the amount quoted in the Contractor's proposal. Such order shall state that funds are available to pay for the change.

(6) If the Contractor does not promptly respond to a request for a proposal, or the Owner determines that the change is essential to the final product of the Work and that the change must be effected immediately to avoid delay of the Project, the Owner may:

- (a) determine with the Contractor a sufficient maximum amount to be authorized for the change and
- (b) direct the Contractor to proceed with the change on a Force Account basis pending delivery of the Contractor's proposal, stating the maximum increase in the Contract Sum that is authorized for the change.

(7) Pending agreement of the parties or final resolution of any dispute of the total amount due the Contractor for a change in the Work, amounts not in dispute for such changes in the Work may be included in Applications for Payment accompanied by an interim Change Order indicating the parties' agreement with part of all of such costs or time extension. Once a

dispute is resolved, it shall be implemented by preparation and execution of an appropriate Change Order.

ARTICLE 20
CLAIMS for EXTRA WORK

- A. “Extra Work” means operations by Contractor that, in the exercise of the reasonable judgment of the Architect, do not reasonably fall within the scope of Work for the Project or constitute a material change in the Specifications. Extra Work excludes any operations by Contractor or costs incurred by it that result from its acts or omissions in performing its obligations under the Contract.
- B. If the Contractor considers that it has been instructed or asked by the Architect, Owner or any public authority having jurisdiction over the Project to perform Extra Work, the Contractor, before performing that Work, shall give a notice to the Architect that includes the following:
- (1) the date, circumstances, and source of the request; (2) the reasons why Contractor considers the request or instructions to perform operations to constitute a change to the Contract Documents; and (3) an estimate of extra cost and time that may be involved to fulfil the request.
- C. Within ten days of receipt of the Contractor’s notice, the Architect will respond in writing to the notice by Contractor, stating one of the following:
- (1) The cited request or instruction is rescinded.
 - (2) The cited request or instruction is a change in the Work and in which manner the Contractor is to proceed with procedures of Article 19, Changes in the Work.
 - (3) The cited request or instruction is reconfirmed, and not determined by the Architect to be Extra Work or a change in the Contract Documents. In that event, the Contractor shall proceed to perform the requested operation as instructed.

Except for claims relating to the performance by Contractor of operations on the Project to remedy emergency conditions that endanger life or property, no claim for Extra Work shall be considered or is payable by Owner in the absence of prior notice required in this Paragraph.

D. If the Contractor disputes the Architect’s determination that the requested operation is not Extra Work, within ten days after receiving the Architect’s response, notify the Architect in writing that the Contractor intends to submit a claim concerning said matter pursuant to Article 24, Resolution of Claims and Disputes.

E. If Contractor’s claim for Extra Work is approved by Architect and Owner, it shall be authorized and paid at the lump sum and other rate set forth in a change order before that work is begun. The

performance of any Extra Work by Contractor shall be subject to all other conditions of the Contract.

ARTICLE 21
DIFFERING SITE CONDITIONS

A. DEFINITION

“Differing Site Conditions” are:

- (1) subsurface or otherwise concealed physical conditions at the Project site which differ materially from those indicated in the Contract Documents, or
- (2) unknown physical conditions at the Project site which are of an unusual nature, differing materially from conditions ordinarily encountered and generally recognized as inherent in construction activities of the character required by the Contract Documents.

B. PROCEDURES

If Differing Site Conditions are encountered by a party at the Project site, the party discovering the condition shall promptly notify the other party before the condition is disturbed; such notice shall in no event be given more than ten days after discovery of the condition. Upon such notice and verification of the existence of a Differing Site Condition, the Architect will, with reasonable promptness and with the Owner’s concurrence, make changes in the Drawings and/or Specifications as are deemed necessary to conform to the Differing Site Condition. Any increase or decrease in the Contract Sum or Contract Time that is warranted by the changes will be made as provided under Article 19, Changes in the Work. If the Architect determines a Differing Site Condition has not been encountered, the Architect shall notify the Owner and Contractor in writing, stating the reason for that determination.

ARTICLE 22
CLAIMS for DAMAGES

If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time after the discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

ARTICLE 23
DELAYS

- A. Contractor may be entitled to an extension of the Contract Time due to delays in the commencement or progress of Work that are result from circumstances that are beyond its reasonable control. Examples of such circumstances are material acts or omissions of the Owner or Architect in performing their responsibilities for the Project, acts or omissions of any separate contractor (other than a Subcontractor), or by labor disputes, unusual delay in deliveries, unavoidable casualties, fires, abnormal floods, tornadoes, or other cataclysmic events of nature. In the event Contractor reasonably considers grounds for an extension of time exists, it shall, within ten days after the delay first occurs, give written notice to the Architect of the cause of the delay and its probable effect on progress of the entire Work.
- B. Adverse weather conditions that are more severe than anticipated for the locality of the Work during any given month may entitle the Contractor to an extension of Contract Time. The following understandings apply concerning any request for delay due to adverse weather:
- (1) the weather conditions must have had an adverse effect on construction scheduled to be performed during the period in which the adverse weather occurred, which in reasonable sequence would have an effect on completion of the entire Work,
 - (2) the Contractor must, within twenty-one days after the end of the month in which the delay occurs, give the Architect written notice of the delay that occurred during that month and its probable effect on progress of the Work, and
 - (3) within a reasonable time after giving notice of the delay, the Contractor must provide the Architect with sufficient data to document that the weather conditions experienced were unusually severe for the locality of the Work during the month in question. Unless otherwise provided in the Contract Documents, data documenting unusually severe weather conditions shall compare actual weather conditions to the average weather conditions for the month in question during the previous five years as recorded by the National Oceanic and Atmospheric Administration (NOAA) or similar record-keeping entities.
- C. Adjustments, if any, of the Contract Time pursuant to this Article shall be incorporated into the Contract by a Contract Change Order prepared by the Architect and signed by the Contractor, Owner, and other signatories to the Construction Contract or, at closeout of the Contract, by mutual written agreement between the Contractor and Owner. The adjustment of the Contract Time shall not exceed the extent to which the delay extends the time required to complete the entire Work of the Contract.
- D. The Contractor shall not be entitled to any adjustment of the Contract Sum for damage due to delays allegedly caused by the acts or omissions of the Owner or Architect in failing to perform their responsibilities related to the Project unless that delay was:

- (1) the result of their bad faith, or
- (2) beyond the contemplation of the parties and not remedied by the Owner or Architect within a reasonable time after notification by the Contractor of the act or omission.

ARTICLE 24
RESOLUTION of CLAIMS and DISPUTES

A. APPLICABILITY of ARTICLE

(1) As used in this Article, “Claims and Disputes” include claims or disputes asserted by the Contractor, its Surety, or Owner arising out of or related to the Contract, or its breach, including without limitation claims seeking, under the provisions of the Contract, equitable adjustment of the Contract Sum or Contract Time, and claims and disputes arising between the Contractor (or its Surety) and Owner regarding interpretation of the Contract Documents, performance of the Work, or breach of or compliance with the terms of the Contract.

(2) “Resolution” addressed in this Article applies only to Claims and Disputes arising between the Contractor (or its Surety) and Owner and asserted after execution of the Construction Contract and prior to the date upon which final payment is made. Upon making application for final payment, the Contractor may reserve the right to subsequent Resolution of existing Claims by including a list of all Claims, in stated amounts, which remain to be resolved and specifically excluding them from any release of claims executed by the Contractor, and in that event Resolution may occur after final payment is made.

B. CONTINUANCE of PERFORMANCE

An unresolved Claim or Dispute shall not be just cause for the Contractor to fail or refuse to proceed diligently with performance of the Contract or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents.

C. GOOD FAITH EFFORT to SETTLE CLAIMS & DISPUTES

The Contractor and Owner agree that, upon the assertion of a Claim by the other, their respective Project Representatives will make a good faith effort, with the Architect’s assistance and advice, to amicably resolve any Claim or dispute. If those Representatives are unable to amicably resolve a Claim or dispute, it will be escalated to the senior manager/official level of each party for consideration. If the Claim or dispute cannot be resolved at the senior official level, either party may request that the Claim or dispute be mediated. If efforts to settle are not successful, the Claim shall be resolved in accordance with paragraph D below.

D FINAL DISPUTE RESOLUTION MECHANISM

If the parties are unable to amicably resolve any Claim or dispute, the dispute resolution mechanism for any Claim between them shall be litigation in a court that is located in Jefferson County, Alabama. If (i) the Owner should employ attorneys or incur other

expenses in any legal action regarding a Claim or dispute, and (ii) the Owner secures a final judgment before a court of competent jurisdiction or obtains other relief from an administrative body related thereto, the Contractor will reimburse the Owner for its reasonable attorneys' fees and other reasonable expenses that are incurred in that action.

E. CONTRACTOR'S EXCLUSIVE REMEDIES FOR BREACH BY OWNER

Contractor agrees and acknowledges that its sole and exclusive remedies arising out of or related to a breach of this Contract by the Owner (or its employees or representatives) are for Contractor to pursue claims for additional Contract Time or adjustment of the Contract Sum pursuant to the terms and principles herein, and to litigate those claims as provided in this Article if they are not amicably resolved by the parties. Contractor shall have no other claim, cause or right against the Owner (or its employees or representatives) related to any actions by them or their failures by them to perform their obligations under the Contract, whether any such claim may be in contract, tort, strict liability or otherwise.

ARTICLE 25
OWNER'S RIGHT to CORRECT DEFECTIVE WORK

If the Contractor fails or refuses to correct Defective Work in a timely manner that will avoid delay of completion, use, or occupancy of the Work or work by the Owner or separate contractors, the Architect may give the Contractor written Notice to Cure the Defective Work within a reasonable, stated time. If, within ten days after Contractor's receipt of that Notice, the Contractor has not proceeded to satisfactorily cure the Defective Work or provided the Architect with written verification that satisfactory remedial action will be taken, the Owner may, without prejudice to any other remedy available to the Owner, correct the Defective Work and deduct the actual cost of the correction from payment then or thereafter due to the Contractor.

ARTICLE 26
OWNER'S RIGHT to STOP or SUSPEND the WORK

A. STOPPING the WORK for CAUSE

If the Contractor fails to correct Defective Work or persistently fails to carry out Work in accordance with the Contract Documents, the Owner may direct the Contractor in writing to stop the Work, or any part of the Work, until the cause for the Owner's directive has been eliminated; however, the Owner's right to stop the Work shall not be construed as a duty of the Owner to be exercised for the benefit of the Contractor or any other person or entity.

B. SUSPENSION by OWNER for CONVENIENCE

(1) Notwithstanding any provision in the Contract, the Owner may, at any time and without cause and in the exercise of its sole discretion, direct the Contractor in writing to suspend, delay or interrupt the Work, or any part of the Work, for a period of time as the Owner may determine. After the period of the temporary suspension expires, the Owner's Project

Representative may give Contractor notice to promptly re-commence prosecution of the Work.

(2) The Contract Sum and Contract Time shall be adjusted, pursuant to Article 19, for reasonable increases in the cost and time caused by an Owner-directed suspension or interruption of Work for the Owner's convenience. However, no adjustment to the Contract Sum shall be made to the extent that the same or concurrent Work is, was or would have been likewise suspended, delayed or interrupted for other reasons not caused by the Owner.

(3) Contractor agrees and acknowledges that, if Owner suspends the Work for its convenience, Contractor is not entitled to receive any type of compensation other than contemplated above in this Article.

(4) Nothing in this provision or elsewhere in the Contract grants Contractor the right to suspend Work at a site without written authority from the Owner Project Representative.

ARTICLE 27
OWNER'S RIGHT to TERMINATE CONTRACT

A. TERMINATION by the OWNER for CAUSE

(1) **Causes for Termination:** The Owner may terminate the Contractor's right to complete the Work, or any designated portion of the Work, if the Contractor:

- (a) should be adjudged bankrupt, or should make a general assignment for the benefit of the Contractor's creditors, or if a receiver should be appointed on account of the Contractor's insolvency to the extent termination for these reasons is permissible under applicable law;
- (b) refuses or fails to prosecute the Work, or any part of the Work, with the diligence that will insure its completion within the Contract Time, including any extensions, or fails to complete the Work within the Contract Time;
- (c) refuses or fails to perform the Work, including prompt correction of Defective Work, in a manner that will insure that the Work, when fully completed, will be in accordance with the Contract Documents;
- (d) fails to pay for labor or materials supplied for the Work or to pay Subcontractors in accordance with the respective Subcontract;
- (e) persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction, or the instructions of the Architect or Owner; or
- (f) breaches any other material obligation owed to Owner under the Contract.

(2) Procedure for Termination of Work and Contract on Construction Contracts Over \$50,000:

(a) Notice to Cure Default: If any of the above conditions giving rise to termination occur, the Architect (or Owner) may give the Contractor and its Surety written Notice to Cure the subject condition(s) within a reasonable, stated time, but not less than ten days after the Contractor receives the notice (the “Notice to Cure Default”).

(b) Notice of Termination: If, at the expiration of the time stated in the Notice to Cure Default, the Contractor has not proceeded to satisfactorily cure the subject condition(s) or provided the Architect with written verification that satisfactory remedial action will be taken, the Owner may, without prejudice to any other rights or remedies of the Owner, give the Contractor and its Surety written notice declaring the Contractor to be in default under the Contract and stating that the Contractor’s right to complete the Work (or a designated portion of the Work) and the Contract shall terminate seven days after the Owner issues a subsequent written Notice of Termination (the “Notice of Termination”). If the condition or circumstance for which a Notice to Cure Default has been given later reoccurs, the Owner subsequently may give the Contractor Notice of Termination without providing the Contractor another Notice to Cure default.

(c) If the Contractor takes appropriate action to cure the circumstances set forth in Owner’s Notice to Cure Default, Contractor may continue operations on the Project; provided that, if Contractor so continues its operations on the Project, Owner will not waive any of its rights under the Contract associated with timely completion of the Project by consenting to that continuation.

(d) If Owner issues a Notice to Cure Default and the Contract is later terminated, Contractor shall discontinue its performance of the Work.

(e) Demand on the Performance Bond: With the Notice of Termination the Owner may give the Surety a written demand that, upon the effective date of the Notice of Termination, the Surety promptly fulfill its obligation to assume control of the Project and complete the Work in accordance with the terms of the Contract and Performance Bond. If such a demand be given to the Surety, the following understandings apply:

(i) Duty of Surety: Upon receiving the Owner’s demand on the Performance Bond, the Surety shall assume all rights and obligations of the Contractor under the Contract.

(ii) Surety Claims: The Surety shall have the right to assert “Surety Claims” to the Owner, which are defined as claims relating to acts or omissions of the Owner or Architect prior to termination of the Contractor which may have prejudiced its rights as Surety or its interest in the unpaid balance of the Contract Sum. If the Surety wishes to assert a Surety Claim, it shall give the Owner, through the Architect, written notice within twenty-one days after first recognizing the condition giving rise to the Surety Claim. The Surety Claim shall then be submitted to the Owner, through the Architect, no later than sixty days after giving notice thereof, but no such Surety Claims shall be considered if submitted after the date upon which final payment becomes due. Final

resolution of Surety Claims shall be pursuant to Article 24, Resolution of Claims and Disputes. The presence or possibility of a Surety Claim shall not be just cause for the Surety to fail or refuse to take charge of and complete the Work or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents; and

(iii) Payments to Surety: If any amounts are payable to the Contractor under the Contract when it is terminated, no further payments shall be made to the Contractor by the Owner. The Surety shall stand in the shoes of the Contractor and be entitled to any such payments. Before making any such payments to Surety, the Owner shall have the right to deduct from them any reasonable costs incurred by the Owner, including compensation for additional architectural, engineering, managerial, and administrative services, attorneys' fees as necessitated by termination of the Contractor and completion of the Work by the Surety, and any amounts chargeable against the Contractor's account on the Project. The Surety shall be solely responsible for accounting to the Contractor for the portion of the Contract Sum paid to Surety by Owner or for the costs and expenses of completing the Work.

(f) Owner's Remedy to Finish Work. In addition to making a demand on the Surety to complete the Project following termination of the Contract, Owner may, but is not obligated to undertake to perform operations on the Project that were not finished by Contractor through another contractor(s) retained by Owner or through Owner's own forces. In such event, the Contractor shall be responsible for the difference, if any, between the amount paid by the Owner to another contractor or expenses attributable to the work of its own forces to complete and that provided for hereunder as the cost of the Work if it had been performed by the Contractor. No failure on the part of the Owner to exercise, and no delay in exercising, any right or remedy hereunder shall operate as a waiver thereof.

(4) Wrongful Termination: If any termination of the Contract by Owner is wrongly given, that termination nonetheless shall continue to be effective. Further, in such event, Contractor agrees that, as its sole and exclusive remedy for any wrongful termination, the Owner shall pay Contractor the amount contemplated in Paragraph B of this Article below that Owner would have paid Contractor had Owner terminated the Contract for its Convenience.

B. TERMINATION by the OWNER for CONVENIENCE

- (1) The Owner may, without cause and at any time, terminate the performance of Work under the Contract in whole, or in part, upon determination by the Owner that such termination is in its best interest. Such termination is referred to herein as Termination for Convenience.
- (2) Upon receipt of a written notice of Termination for Convenience from the Owner, the Contractor shall:

- (a) stop Work as specified in the notice;
- (b) enter into no further subcontracts or purchase orders for materials, services, or facilities, except as may be necessary for Work directed to be performed prior to the effective date of the termination or to complete Work that is not terminated;
- (c) terminate all existing subcontracts and purchase orders to the extent they relate to the terminated Work;
- (d) take such actions as are necessary, or directed by the Architect or Owner, to protect, preserve, and make safe the terminated Work; and
- (e) complete performance of the Work that is not terminated.

(3) In the event of Termination for Convenience, the Contractor shall be entitled to receive payment for the Work performed prior to its termination, including materials and equipment purchased and delivered for incorporation into the terminated Work, and any reasonable costs incurred because of the termination. Such payment shall include reasonable mark-up of costs for overhead and profit, not to exceed the limits stated in Article 19 (Changes in the Work). The Contractor shall be entitled to receive payment for reasonable anticipated overhead at the home office level, but shall not be entitled to receive payment for any profits anticipated to have been gained from the terminated Work. Contractor agrees and acknowledges that no other compensation is payable to Contractor in connection with a Termination for Convenience by Owner.

Documentation related to any decreases in the Contract Sum related to a Termination for Convenience by Owner shall be submitted to the Architect by the Contractor in such time and detail, and with such supporting documentation.

Final modification of the Contract related to a Termination for Convenience shall be by Contract Change Order pursuant to Article 19. Any Claim or Dispute involving the Termination or any amount due a party as a result thereof shall be resolved pursuant to Article 24.

ARTICLE 28

CONTRACTOR'S RIGHT to SUSPEND or TERMINATE the CONTRACT

A. SUSPENSION by the OWNER

If all of the Work is suspended or delayed for a period of sixty days for the Owner's convenience or under an order of any court, or other public authority through no act or fault of the Contractor or a Subcontractor (or any other party for whose acts they may be liable), then the Contractor may give the Owner a written Notice of Termination stating that Owner has fourteen days after receiving that Notice to authorize Contractor to resume the Work. Absent the Contractor's receipt of authorization to resume the Work during that fourteen day period, the Contract shall terminate upon expiration of that period and the Contractor will be compensated by the Owner as if the termination had been for the Owner's convenience pursuant to Article 27 B (Termination for Convenience by Owner).

B. NONPAYMENT

If (i) the Owner fails to pay the undisputed amount of an Application for Payment that has been certified by the Architect within sixty days after receiving same. and (ii) Contractor gives the Owner written notice that the Work will be suspended pending payment of undisputed amount within fourteen days (or such specified longer period) from such notice, Contractor may terminate the Contract at the end of that cure period if payment is not received during that period. If the Work is then suspended for nonpayment, but resumed upon receipt of payment, the Contractor will be entitled to compensation as if the suspension had been by the Owner pursuant to Article 26, Paragraph B (Suspension for Convenience by Owner).

If the Contract is ultimately terminated by Contractor for nonpayment, the Contractor will be entitled to compensation as if the termination had been by the Owner pursuant to Article 27, Paragraph B (Termination for Convenience by Owner).

ARTICLE 29
PROGRESS PAYMENTS/RETAINAGE

A. FREQUENCY of PROGRESS PAYMENTS

Unless otherwise provided in the Contract Documents, the Owner will make payments to the Contractor as the Work progresses based on monthly estimates prepared and certified by the Contractor, approved and certified by the Architect, and approved by the Owner and other authorities whose approval is required.

- B. SCHEDULE of VALUES.** Unless the preparation and use of a Schedule of Values is waived by the Architect or Owner for the Project, within ten days after receiving the Notice to Proceed the Contractor shall submit to the Architect a commercially acceptable form of a Schedule of Values, which is a breakdown of the Contract Sum showing the value of the various parts of the Work for billing purposes. The Schedule of Values shall divide the Contract Sum into as many parts (“line items”) as the Architect and Owner determine necessary to permit evaluation and to show amounts attributable to Subcontractors. The Contractor’s overhead and profit are to be proportionately distributed throughout the line items of the Schedule of Values. Upon approval, the Schedule of Values shall be used as a basis for monthly Applications for Payment, unless it is later found to be in error. Approved change order amounts shall be added to or incorporated into the Schedule of Values as mutually agreed by the Contractor and Architect.

C. APPLICATIONS for PAYMENTS

- (1) Based on the approved Schedule of Values, each Application and Certificate for Payment shall show the Contractor’s estimate of the value of Work performed in each line item as of the end of the billing period. The Contractor’s cost of materials and equipment not yet incorporated into the Work, but delivered and suitably stored on the site, may be

considered in monthly Applications for Payment. One payment application per month may be submitted.

- (2) The Contractor's estimate of the value of Work performed and stored materials must represent such reasonableness as to warrant certification by the Architect to the Owner in accordance with Article 30. Each monthly Application for Payment shall be supported by such data as will substantiate the Contractor's right to payment, including without limitation copies of requisitions from subcontractors and material suppliers.
- (3) If no other date is stated in the Contract Documents or agreed upon by the parties, each Application for Payment shall be submitted to the Architect on or about the first day of each month and payment shall be issued to the Contractor within thirty days after an Application for Payment is Certified by the Architect pursuant to Article 30 and delivered to the Owner.

D. MATERIALS STORED OFF SITE

Unless otherwise provided in the Contract Documents, the Contractor's cost of materials and equipment to be incorporated into the Work, which are stored off the site, may also be considered in monthly Applications for Payment if all of the following conditions exist:

- (1) the Contractor has received written approval from the Architect and Owner to store the materials or equipment off site in advance of delivering the materials to the Project location;
- (2) a Certificate of Insurance is furnished to the Architect evidencing that a special insurance policy, or rider to an existing policy, has been obtained by the Contractor providing all-risk property insurance coverage, specifically naming the materials or equipment stored, and naming the Owner as an additionally insured party;
- (3) the Architect is provided with a detailed inventory of the stored materials or equipment and the materials or equipment are clearly marked in correlation to the inventory to facilitate inspection and verification of the presence of the materials or equipment by the Architect or Owner;
- (4) the materials or equipment are properly and safely stored in a bonded warehouse, or a facility otherwise approved in advance by the Architect; and
- (5) compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest.

E. RETAINAGE

- (1) "Retainage" is defined as the money earned, and, therefore, belonging to the Contractor (subject to final settlement of the Contract and resolution of all outstanding claims) that has been retained by the Owner conditioned on final completion and acceptance of all Work required by the Contract Documents. Retainage shall not be relied upon by Contractor (or Surety) to cover or off-set unearned monies attributable to uncompleted or uncorrected Work.

- (2) In making progress payments for Work completed, the Owner will remit payment with respect to the undisputed portion of the Applications for Payment certified by the Architect, less 5% amount as authorized by the Public Works law to be retained and less any previous payments. If, upon completion of fifty (50%) percent of the value of the Total Contract and the Owner determining that satisfactory progress on the Project is being made, retainage will not be withheld on subsequent partial payments. For purposes of calculating the amount of the Total Contract, Materials Stored Off Site that satisfy the conditions set forth above may be included in that calculation.
- (3) The retained amounts shall be held by the Owner until final completion and acceptance of all Work contemplated under the Contract, at which time any retained amounts and other amounts then due Contractor shall be paid in full or otherwise applied by the Owner as is contemplated in the Contract. Retainage shall be released upon completion of all close-out requirements per Article 34 and the review, approval and processing of Contractor's final Application for Payment.

F. CONTRACTOR'S CERTIFICATION OF APPLICATIONS FOR PAYMENT

- (1) Each Application for Payment shall bear the Contractor's notarized certification that, to the best of the Contractor's knowledge, information, and belief, the Work covered by the Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payments were issued and payments received from the Owner and that the current payment shown in the Application for Payment has not yet been received.
- (2) By making this certification the Contractor represents to the Architect and Owner that, upon receipt of previous progress payments from the Owner, the Contractor has promptly paid each Subcontractor, in accordance with the terms of its agreement with the Subcontractor, the amount due the Subcontractor from the amount included in the progress payment on account of the Subcontractor's Work and stored materials. The Architect and Owner may advise Subcontractors and suppliers regarding percentages of completion or amounts requested and/or approved in an Application for Payment on account of the Subcontractor's Work and stored materials.

G. PAYMENT ESTABLISHES OWNERSHIP

Upon payment by the Owner for materials or Work covered by partial estimates, that material and Work shall become the property of the Owner; provided, however, that any such payment (a) shall not relieve the Contractor from its sole responsibilities to care and protect material and Work upon which payments have been made and restore any damaged material and Work until Final Acceptance occurs; (b) shall in no way constitute acceptance of the associated Work, and (c) shall in no way limit or affect the obligation of the Contractor, at its expense, to repair, correct, renew or replace any defective materials or workmanship.

ARTICLE 30
CERTIFICATION and APPROVALS for PAYMENT

- A. The Architect's review, approval, and certification of Applications for Payment shall be based on the Architect's general knowledge of the Work obtained through site visits and the information provided by the Contractor with the Application. The Architect shall not be required to perform exhaustive examinations, evaluations, or estimates of the cost of completed or uncompleted Work or stored materials to verify the accuracy of amounts requested by the Contractor, but the Architect shall have the authority to adjust the Contractor's estimate when, in the Architect's reasonable opinion, such estimates are overstated or otherwise inaccurate.
- B. Within seven days after receiving the Contractor's monthly Application for Payment, or such other time as may be stated in the Contract Documents, the Architect will take one of the following actions:
- (1) The Architect will approve and certify the Application as submitted and forward it to the Owner as a Certification for Payment for approval by the Owner (and other approving authorities, if any) and payment.
 - (2) If the Architect takes exception to any amounts claimed by the Contractor and the Contractor and Architect cannot agree on revised amounts, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to certify to the Owner, transmitting a copy of same to the Contractor.
 - (3) To the extent the Architect determines may be necessary to protect the Owner from loss on account of any of the causes stated in Article 31, the Architect may subtract from the Contractor's estimates and will issue a Certificate for Payment to the Owner, with a copy to the Contractor, for such amount as the Architect determines is properly due and notify the Contractor and Owner in writing of the Architect's reasons for withholding payment in whole or in part.
- C. Neither the Architect's issuance of a Certificate for Payment nor the Owner's resulting progress payment shall be a representation to the Contractor that the Work in progress or completed at that time is accepted or deemed to be in conformance with the Contract Documents.
- D. The Architect shall not be required to determine that the Contractor has promptly or fully paid Subcontractors and suppliers or how or for what purpose the Contractor has used monies paid under the Construction Contract. However, the Architect may, upon request and if practical, inform any Subcontractor or supplier of the amount, or percentage of completion, approved or paid to the Contractor on account of the materials supplied or the Work performed by the Subcontractor.

ARTICLE 31
PAYMENTS WITHHELD

- A. The Architect may decline to approve an Application for Payment, or nullify or revise a previously issued Certificate for Payment to the extent as, in the Architect's opinion, is necessary to protect the Owner from loss on account of any of the following causes or conditions that were not discovered or fully accounted for at the time of the certification or approval of the Application for Payment:
- (1) Defective Work;
 - (2) filed, or reasonable evidence indicating probable filing of, claims arising out of the Contract by other parties against the Contractor;
 - (3) the Contractor's failure to pay for labor, materials or equipment or to pay Subcontractors;
 - (4) reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
 - (5) damage suffered by the Owner or another contractor caused by the Contractor, a Subcontractor, or anyone for whose acts they may be liable;
 - (6) reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance is insufficient to cover applicable liquidated damages; or
 - (7) the Contractor's persistent failure to conform to the requirements of the Contract Documents.
- B. If the Architect or Owner deems it necessary to withhold payment pursuant to existence of the conditions set forth in Paragraph A above. the Owner will notify the Contractor and Architect in writing of the amount to be withheld and the reason for same.
- C. The Architect shall not be required to withhold payment for completed or partially completed Work for which compliance with the Contract Documents remains to be determined by Specified Inspections or Final Inspections to be performed in their proper sequence. However, if Work for which payment has been approved, certified, or made under an Application for Payment is subsequently determined to be Defective Work, the Architect shall determine an appropriate amount that will protect the Owner's interest against the Defective Work.
- (1) If payment has not been made against the Application for Payment first including the Defective Work, the Architect will notify the Owner and Contractor of the amount to be withheld from the payment until the Defective Work is brought into compliance with the Contract Documents.
 - (2) If payment has been made against the Application for Payment first including the Defective Work, the Architect will withhold the appropriate amount from the next Application for Payment submitted after the determination of noncompliance, such amount to then be withheld until the Defective Work is brought into compliance with the Contract Documents.

- D. The amount withheld will be paid with the next Application for Payment certified and approved after the condition for which the Owner has withheld payment is removed or otherwise resolved to the Owner's satisfaction.
- E. Contractor agrees and acknowledges that the Owner shall have the right to withhold from payments due the Contractor under the Contract for the Project an amount equal to any amount which the Contractor owes the Owner under another contract.

ARTICLE 32
SUBSTANTIAL COMPLETION

- A. Substantial Completion is the stage in the progress of the Work when the Work or designated portion of the Work is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use without disruption or interference by the Contractor in completing or correcting any remaining unfinished Work ("punch list" items).
- B. The Contractor shall notify the Architect in writing when it considers the Work, or a portion of the Work which the Owner has agreed to accept separately, to be substantially complete and ready for a Final Inspection pursuant to Article 16. In this notification the Contractor shall identify any items remaining to be completed or corrected for Final Acceptance prior to final payment.
- C. Substantial Completion is achieved and a Final Inspection is appropriate only when a minimal number of punch list items exists and only a short period of time will be required to correct or complete them. Upon receipt of the Contractor's request for a Final Inspection, the Architect will advise the Contractor in writing of any conditions of the Work which the Architect or Owner is aware do not constitute Substantial Completion, and Final Inspection will proceed within a reasonable time after the Contractor's notice is given. However, the Architect will not be required to prepare lengthy listings of punch list items; therefore, if the Final Inspection discloses that Substantial Completion has not been achieved, the Architect may discontinue or suspend that Inspection until the Contractor does achieve Substantial Completion.

D. CERTIFICATE of SUBSTANTIAL COMPLETION

- (1) When the Work or a designated portion of the Work is substantially complete, the Architect will prepare and sign a Certificate of Substantial Completion to be signed in order by the Contractor, and Owner.
- (2) When signed by all parties, the Certificate of Substantial Completion shall establish the Date of Substantial Completion which is the date upon which:
 - (a) the Work, or designated portion of the Work, is accepted by the Architect and Owner as being ready for occupancy or use;

(b) the Contractor's one-year and special warranties for the Work covered by the Certificate commence, unless stated otherwise in the Certificate. (As provided below in Article 35B, the one-year warranty for punch list items completed or corrected after the period allowed in the Certificate shall commence on the date of their Final Acceptance): and

(c) Owner becomes responsible for building security, maintenance, utility services, and insurance, unless stated otherwise in the Certificate.

(3) The Certificate of Substantial Completion shall set the time within which the Contractor shall finish all items on the "punch list" accompanying the Certificate. The completion of punch list items shall be a condition precedent to Final Payment.

(4) If the Work or designated portion covered by a Certificate of Substantial Completion includes roofing work, the General Contractor's (5-year) Roofing Guarantee must be executed by the Contractor and attached to the Certificate of Substantial Completion. If the Contract Documents specify any other roofing warranties to be provided by the roofing manufacturer, Subcontractor, or Contractor, they must also be attached to the Certificate of Substantial Completion.

E. The Date of Substantial Completion of the Work, as set in the Certificate of Substantial Completion of the Work or of the last completed portion of the Work, establishes the extent to which the Contractor is liable for Liquidated Damages, if any; however, should the Contractor fail to complete all punch list items within thirty days, or such other time as may be stated in the respective Certificate of Substantial Completion, the Contractor shall bear any expenses, including charges for additional Architectural services and expenses that the Owner may incur and Owner's cost to correct the punch list items, that are incurred by the Owner as a result of such failure to complete punch list items in a timely manner.

ARTICLE 33

OCCUPANCY or USE PRIOR to COMPLETION

A. UPON SUBSTANTIAL COMPLETION

Prior to completion of the entire Work, the Owner may occupy or begin utilizing any designated portion of the Work on the agreed Date of Substantial Completion of that portion of the Work.

B. BEFORE SUBSTANTIAL COMPLETION

(1) If applicable on a Project involving construction or improvement of a building, the Owner shall not occupy or utilize any portion of the Work before Substantial Completion of that portion has been achieved.

(2) If applicable on a Project involving construction or improvement of a building, the Owner may deliver furniture and equipment and store, or install it in place ready for

occupancy and use, in any designated portion of the Work before it is substantially completed under the following conditions:

- (a) The Owner's storage or installation of furniture and equipment will not unreasonably disrupt or interfere with the Contractor's completion of the designated portion of the Work.
- (b) The Contractor consents to the Owner's planned action (such consent shall not be unreasonably withheld).
- (c) The Owner shall be responsible for insurance coverage of the Owner's furniture and equipment, and the Contractor's liability shall not be increased.
- (d) The Contractor, Architect, and Owner will jointly inspect and record the condition of the Work in the area before the Owner delivers and stores or installs furniture and equipment; the Owner will equitably compensate the Contractor for making any repairs to the Work that may subsequently be required due to the Owner's delivery and storage or installation of furniture and equipment.
- (e) The Owner's delivery and storage or installation of furniture and equipment shall not be deemed an acceptance of any Work not completed in accordance with the requirements of the Contract Documents.

ARTICLE 34 **FINAL PAYMENT**

A. PREREQUISITES to FINAL PAYMENT

The following conditions are prerequisites to Final Payment becoming due the Contractor:

- (1) Full execution of a Certificate of Substantial Completion for the Work, or each designated portion of the Work.
- (2) Final Acceptance of the Work.
- (4) The Contractor's completion, to the satisfaction of the Architect and Owner, of all documentary requirements of the Contract Documents; such as delivery of "as-built" documents, operating and maintenance manuals, warranties, etc.
- (5) Delivery to the Owner of a final Application for Payment, prepared by the Contractor and approved and certified by the Architect.
- (6) Completion of an Advertisement for Completion pursuant to Paragraph C below.
- (7) Delivery by the Contractor to the Owner through the Architect of a Release of Claims and such other documents as may be required by Owner, satisfactory in form to the Owner pursuant to Paragraph D below.

- (8) Consent of Surety to Final Payment, if any, to Contractor. This Consent of Surety is required for projects which have Payment and Performance Bonds.
- (9) Delivery by the Contractor to the Architect and Owner of other documents, if any, required by the Contract Documents as prerequisites to Final Payment.

Excluding Contractor's obligations related to punch list items, the Contract shall not be considered to have been fulfilled until Contractor has satisfied each of the above conditions. Notwithstanding, Contractor's fulfillment of the above conditions shall not be construed to waive, modify, limit or affect any of the Owner's rights hereunder related to the Contractor's Warranties of Work, any of the Owner's rights under any bonds or any of its rights or remedies under law.

B. FINAL ACCEPTANCE of the WORK

"Final Acceptance of the Work" shall be achieved when all "punch list" items recorded with the Certificate(s) of Substantial Completion are accounted for by either: (1) their completion or correction by the Contractor and acceptance by the Architect and Owner, or (2) their resolution under Article 18, Deductions for Uncorrected Work.

Except for any part of the Work that Owner occupies or use after Substantial Completion, Contractor shall remain responsible for its Work until it is finally accepted by the Architect (or Engineer) or City Project Representative. All Work shall remain under the charge and care of the Contractor, and it shall take every necessary precaution to prevent injury or damage to any person related to that work site from any other cause whatsoever until that acceptance occurs. Further, except if otherwise provided in the Contract, Contractor, at its own expense, shall rebuild, repair, and remedy any damage to any portion of the Work that is occasioned by any cause before final acceptance.

C. ADVERTISEMENT for COMPLETION

If the Contract Sum is more than \$50,000, the Contractor, immediately after being notified by the Architect that all other requirements of the Contract have been completed, shall give public notice of completion of the Contract by having an Advertisement for Completion published for a period of four successive weeks in some newspaper of general circulation published within the city or county where the Work was performed. Proof of publication of the Advertisement for Completion shall be made by the Contractor to the Architect by affidavit of the publisher, in duplicate, and a printed copy of the Advertisement for Completion published, in duplicate. If no newspaper is published in the county where the work was done, the notice may be given by posting at the Court House for thirty days and proof of same made by Probate Judge or Sheriff and the Contractor. Final payment shall not be due until thirty days after this public notice is completed.

D. RELEASE of CLAIMS

The Release of Claims and other documents referenced in Paragraph A(6) above are as follows:

- (1) A release executed by Contractor of all claims and claims of lien against the Owner arising under and by virtue of the Contract, other than such claims of the Contractor, if any, as may have been previously made in writing and as may be specifically excepted by the Contractor from the operation of the release in stated amounts to be set forth therein.
- (2) An affidavit under oath, if required, stating that so far as the Contractor has knowledge or information, there are no claims or claims of lien which have been or will be filed by any Subcontractor, Supplier or other party for labor or material for which a claim or claim of lien could be filed.
- (3) A release, if required, of all claims and claims of lien made by any Subcontractor, Supplier or other party against the Owner or unpaid Contract funds held by the Owner arising under or related to the Work on the Project; provided, however, that if any Subcontractor, Supplier or others refuse to furnish a release of such claims or claims of lien, the Contractor may furnish a bond executed by Contractor and its Surety to the Owner to provide an unconditional obligation to defend, indemnify and hold harmless the Owner against any loss, cost or expense, including attorney's fees, arising out of or as a result of such claims, or claims of lien, in which event Owner may make Final Payment notwithstanding such claims or claims of lien. If Contractor and Surety fail to fulfill their obligations to Owner under the bond, the Owner shall be entitled to recover damages as a result of such failure, including all costs and reasonable attorney's fees incurred to recover such damages.

E. EFFECT of FINAL PAYMENT

- (1) The making of Final Payment shall constitute a waiver of Claims by the Owner except those arising from:
 - (a) liens, claims, security interests or encumbrances arising out of the Contract that are unsettled;
 - (b) failure of the Work to comply with the requirements of the Contract Documents;
 - (c) warranties or indemnities required by the Contract Documents which by their nature survive Final Payment or termination of the Contract; or
 - (d) latent defects.
- (2) Acceptance of Final Payment by the Contractor shall constitute a waiver of claims by Contractor against the Owner for all matters or claims arising out of the Project or Contract, except those previously made in writing, identified by Contractor as unsettled at the time of final Application for Payment, and specifically excepted from the release provided for in Paragraph D above.

ARTICLE 35
CONTRACTOR'S WARRANTIES of WORK

A. GENERAL WARRANTY

The Contractor warrants to the Owner and Architect that all materials and equipment furnished under the Contract will be of good quality and new, except such materials as may be expressly provided or allowed in the Contract Documents to be otherwise, and that none of the Work will be Defective Work as defined in Article 1.

B. ONE-YEAR WARRANTY

(1) Contractor also warrants the fitness and soundness of all workmanship and materials for a period of one year after Substantial Completion of its Work. If, within one year after the date of Substantial Completion of the Work or a designated portion of the Work (or otherwise as agreed upon in a mutually-executed Certificate of Substantial Completion), any of the Work is found to be Defective Work, the Contractor, at its expense, shall promptly upon receipt of written notice from the Owner or Architect, and without expense to either, replace or correct the Defective Work to conform to the requirements of the Contract Documents, and repair all damage to the site, the building and its contents which is the result of Defective Work or its replacement or correction.

None of the following shall relieve the Contractor of liability or responsibility with respect to this warranty or responsibility for to replace or repair faulty materials or workmanship: (a) final payment or the issuance of a certificate of Final Acceptance for part or all of the Project, (b) any provision in the Contract Documents, or (c) the City's partial or entire use of any Work site.

(2) Contractor also gives a one-year warranty for Work performed to complete punch list items. That warranty shall begin on the Date of Substantial Completion if those items are completed or corrected within the time period allowed in the Certificate of Substantial Completion in which they are recorded. The one-year warranty for punch list items that are not completed or corrected within the time period allowed in the Certificate of Substantial Completion, and other Work performed after Substantial Completion, shall begin on the date of Final Acceptance of the Work. The Contractor's correction of Work pursuant to this warranty does not extend the period of the warranty. The Contractor's one-year warranty does not apply to defects or damages due to improper or insufficient maintenance, improper operation, or wear and tear during normal usage.

(3) Upon recognizing a condition of Defective Work, the Owner shall promptly notify the Contractor of the condition. If the condition is causing damage to the building, its contents, equipment, or site, the Owner shall take reasonable actions to mitigate the damage or its continuation, if practical. If the Contractor fails to proceed promptly to comply with the terms of the warranty, or to provide the Owner with satisfactory written verification that positive action is in process, the Owner may have the Defective Work replaced or corrected and the Contractor and the Contractor's Surety shall be liable for all expense incurred.

(4) **Year-End Inspection(s):** An inspection of the Work, or each separately completed portion thereof, is required near the end of the Contractor's one-year warranty period(s). The inspection must be scheduled with the Owner, Architect and DCM Inspector. The subsequent delivery of the Architect's report of a Year-End Inspection will serve as confirmation that the Contractor was notified of Defective Work found within the warranty period.

(5) The Contractor's warranty of one year is in addition to, and not a limitation of, any other remedy stated herein or available to the Owner under applicable law.

C. GENERAL CONTRACTOR'S ROOF GUARANTEE (if Project Includes Roofing)

(1) In addition to any other roof related warranties or guarantees that may be specified in the Contract Documents, the roof and associated work shall be guaranteed by the General Contractor against leaks and defects of materials and workmanship for a period of five (5) years, starting on the Date of Substantial Completion of the Project as stated in the Certificate of Substantial Completion. This guarantee for punch list items shall begin on the Date of Substantial Completion if they are completed or corrected within the time period allowed in the Certificate of Substantial Completion in which they are recorded. The guarantee for punch list items that are not completed or corrected within the time period allowed in the Certificate of Substantial Completion shall begin on the date of Final Acceptance of the Work.

(2) This guarantee does not include costs which might be incurred by the General Contractor in making visits to the site requested by the Owner regarding roof problems that are due to lack of proper maintenance (keeping roof drains and/or gutters clear of debris that cause a stoppage of drainage which results in water ponding, overflowing of flashing, etc.), or damages caused by vandalism or misuse of roof areas. Should the contractor be required to return to the job to correct problems of this nature that are determined not to be related to faulty workmanship and materials in the installation of the roof, payment for actions taken by the Contractor in response to such request will be the responsibility of the Owner. A detailed written report shall be made by the General Contractor on each of these 'Service Calls' with copies to the Architect and Owner.

D. SPECIAL WARRANTIES

(1) The Contractor shall deliver to the Owner through the Architect all special or extended warranties required by the Contract Documents from the Contractor, Subcontractors, and suppliers.

(2) The Contractor and the Contractor's Surety shall be liable to the Owner for such special warranties during the Contractor's one-year warranty period; thereafter, the Contractor's obligations relative to such special warranties shall be to provide reasonable assistance to the Owner in their enforcement.

E. ASSUMPTION of GUARANTEES of OTHERS

If the Contractor disturbs, alters, or damages any work guaranteed under a separate contract to the extent that those operates void any guarantee for that work, the Contractor shall restore

the work to a condition satisfactory to the Owner and shall also guarantee it to the same extent that it was guaranteed under the separate contract.

ARTICLE 36
INDEMNIFICATION AGREEMENT

To the fullest extent permitted by law, the Contractor shall defend, indemnify, and hold harmless the Owner, Architect, Architect's consultants, and their respective agents, employees, and consultants (hereinafter collectively referred to as the "Indemnitees") from and against all claims, damages, losses and expenses (including but not limited to attorneys' fees) asserted by third parties (including any employee, Subcontractor or representative of the Contractor) against the Indemnitees or incurred by them arising out of, related to, or resulting from Contractor's performance of the Work or the Contract, provided that such claim, damage, loss or expense is (i) attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (including loss of use resulting therefrom) and caused by or results in whole in part by negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable (collectively, a "Contractor Representative"), regardless of whether such claim, damage, loss or expense is caused in part, or is alleged but not legally established to have been caused in whole or in part by the negligence or other fault of a party indemnified hereunder, or (ii) attributable to the failure of the Contractor or a Contractor Representative to perform its or their responsibilities under the Contract.

Additionally, Contractor shall indemnify and hold harmless the Indemnitees from claims, damages, losses and expenses (including reasonable attorneys' fees) arising from the following:

- (i) any violation by of law, ordinance, regulation, order or decree applicable to the Project that is committed by Contractor or a Contractor Representative in the course of performing the Work;
- (ii) claims made by any Contractor Representative against Owner on account of any conditions at a Work site or amount arising or recovered under the Workmen's Compensation Law;
- (iii) just claims for materials, supplies, tools, equipment or labor supplied or performed on the Project by any Subcontractor or supplier;
- (iv) if any damage or injury is caused to private property or public property on account of any act, omission, neglect or misconduct by Contractor or Contractor Representative in performing the Work, Contractor, at its sole expense, shall restore such property to a condition similar or equal to that existing before the damage occurred and duly compensate the owner of that property for any resulting damage or injury; and

(v) all claims, demands, royalties or fees related to alleged infringement of patents or other intellectual property rights as provided in Article 45 herein.

The scope of Contractor's indemnification obligation under this Article does not extend to claims, demands or expenses resulting from the following:

- (i) actions of the Architect, or the Architect's Consultants, agents, or employees in (i) preparing or approving maps, shop drawings, opinions, reports, surveys, field orders, Change Orders, Drawings or Specifications, or (ii) the giving of or the failure to give directions or instructions, provided such giving or failure to give instructions is the primary cause of the injury or damage; or
- (ii) a claim, damage, loss or expense resulting from the sole negligence of an Indemnitee.

ARTICLE 37
CONTRACTOR'S and SUBCONTRACTORS' INSURANCE

A. INSURANCE REQUIREMENTS OF CONTRACTOR. Unless otherwise provided in the Contract Documents, the Contractor shall purchase and maintain throughout the Contract the following types of insurance coverage with liability limits not less than stated below:

(1) Worker's Compensation & Employer's Liability

- (a) Workers' Compensation coverage in accordance with the statutory coverage required in Alabama.
- (b) Employer's Liability Insurance limits shall be at least:
 - 1. Bodily Injury by Accident - \$1,000,000 each accident
 - 2. Bodily Injury by Disease - \$1,000,000 each employee

(2) Commercial General Liability Insurance

(a) This Insurance, written on an ISO Occurrence Form (current edition as of the date of Invitation for Bids) or equivalent, shall include, but need not be limited to, coverage for bodily injury and property damage arising from premises and operations liability, products and completed operations liability, blasting and explosion, collapse of structures, underground damage, personal injury liability and contractual liability.

The Insurance shall provide at minimum the following limits:

<u>Coverage</u>	<u>Limit</u>
1. General Aggregate Project	\$ 1,000,000.00 per Project
2. Products, Completed Operations Aggregate Project	\$ 1,000,000.00 per Project
3. Personal and Advertising Injury Occurrence	\$ 1,000,000.00 per Occurrence

4. Each Occurrence \$ 1,000,000.00

(b) Additional Requirements for Commercial General Liability Insurance:

1. The policy shall name the Owner and Architect (or Engineer) as additional insureds, state that this coverage shall be primary insurance for the additional insureds; and contain no exclusions of the additional insureds relative to job accidents.
2. The policy must include separate per project aggregate limits.

3. Commercial Business Automobile Liability Insurance

(a) This Insurance shall include coverage for bodily injury and property damage arising from the operation of any owned, non-owned or hired automobile, and shall provide not less than \$1,000,000 Combined Single Limits for each occurrence.

(b) The policy shall name the Owner and Architect (or Engineer) as additional insureds.

(4) Commercial Umbrella Liability Insurance

(a) This Insurance will provide excess coverage above the Commercial General Liability and Commercial Business Automobile Liability to satisfy the minimum limits set forth herein.

(b) Minimum Combined Primary Commercial General Liability and Commercial/Excess Umbrella Limits of:

1. \$ 1,000,000 per Occurrence
2. \$ 1,000,000 Aggregate

(c) Additional Requirements for Commercial Umbrella Liability Insurance:

1. The policy shall name the Owner and Architect as additional insureds.
2. The policy must be on an "occurrence" basis.

(5) Builder's Risk Insurance

If the Project pertains to the construction or improvement of a building or structure that is intended to be occupied, this Policy shall be made payable to the Owner and Contractor, as their interests may appear. The policy amount shall be equal to 100% of the Contract Sum, written on a Causes of Loss - Special Form (current edition as of the date of Invitation for Bids), or its equivalent. All deductibles shall be the sole responsibility of the Contractor.

All required insurance coverage shall be provided by a policy (ies) issued by a company(ies) qualified to engage in the insurance business in the State of Alabama with a rating

reasonably acceptable to the Owner. These insurance requirements are in addition to and do not affect any indemnification obligation of the Contractor herein.

Each policy shall be endorsed to provide that the insurance company agrees that the policy shall not be canceled, changed, allowed to lapse or allowed to expire for any reason until thirty days after the Owner has received written notice by certified mail as evidenced by return receipt or until such time as other insurance coverage providing protection equal to protection called for in the Contract Documents shall have been received, accepted and acknowledged by the Owner. Such notice shall be valid only as to the Project as shall have been designated by Project Name and Number in said notice. Before the commencement of the Work hereunder, the Contractor shall provide the Owner a certificate(s) of insurance and endorsements (including the additional insured endorsements) evidencing compliance with the requirements in this section.

B. SUBCONTRACTORS' INSURANCE

(1) Worker's Compensation & Employer's Liability Insurance. The Contractor shall require each Subcontractor to obtain and maintain Workers' Compensation and Employer's Liability Insurance coverages as described in preceding Paragraph A, or to be covered by the Contractor's Workers' Compensation and Employer's Liability Insurance while performing Work under the Contract.

(2) Liability. The Contractor shall require each Subcontractor to obtain and maintain adequate General Liability, Automobile Liability, and Umbrella Liability Insurance coverages similar to those described in preceding Paragraph A. Such coverage shall be in effect at all times that a Subcontractor is performing Work under the Contract.

(3) Responsibility for Enforcement. The Contractor shall have responsibility to enforce its Subcontractors' compliance with these or similar insurance requirements. Upon request from the Architect or Owner, Contractor shall provide reasonable evidence that any of its Subcontractors is carrying acceptable insurance.

C. TERMINATION of OBLIGATION to INSURE

Unless otherwise expressly provided in the Contract Documents, the obligations to insure as provided herein shall continue as follows:

(1) Builder's Risk Insurance. If the Project pertains to the construction or improvement of a building or structure that is intended to be occupied, the obligation to insure under Subparagraph A(5) shall remain in effect until the Date of Substantial Completion as shall be established in the Certificate of Substantial Completion.

(2) Products and Completed Operations. The obligation to carry Products and Completed Operations coverage specified under Subparagraph A(2) shall remain in effect for two years after the Date(s) of Substantial Completion.

(3) All Other Insurance. The obligation to carry other insurance coverages specified under Subparagraphs A(1) through A(4) and Paragraph B shall remain in effect after the Date(s) of Substantial Completion until such time as all Work required by the Contract Documents is completed. Equal or similar insurance coverages shall remain in effect if, after completion of the Work, the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, returns to the Project to perform warranty or maintenance work pursuant to the terms of the Contract Documents.

ARTICLE 38
PERFORMANCE and PAYMENT BONDS

A. GENERAL

When signing and returning the Construction Contract to the Owner for execution, the Contractor, at its expense, shall also furnish a Performance Bond for the Project in favor of the Owner for the Penal Sum of 100% of the Contract Sum, and a Labor & Materials Payment Bond for the Project for 50% of the Contract Sum. Each bond shall be executed by a surety company (Surety) acceptable to the Owner and duly authorized and qualified to make such bonds in the State of Alabama in the required amount.

The provisions of this Article are not applicable to this Contract if the Contract Sum for the Project is less than \$50,000.

B. PERFORMANCE BOND

Through the Performance Bond, the Surety's obligation to the Owner shall be to assure the prompt and faithful performance of the Contract and Contract Change Orders. The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. In case of default on the part of the Contractor, the Surety shall take charge of and complete the Work in accordance with the terms of the Performance Bond. Any reasonable expenses incurred by the Owner as a result of default on the part of the Contractor, including architectural, engineering, administrative, and legal services, shall be recoverable by Owner under the Performance Bond.

C. LABOR & MATERIALS PAYMENT BOND

With this Labor & Materials Payment Bond the Surety's obligation to the Owner shall be to guarantee that the Contractor and its Subcontractors shall promptly make payment to all persons supplying labor, materials, or supplies for, or in, the prosecution of the Work, including the payment of any reasonable attorneys' fees incurred by successful claimants or plaintiffs in civil actions related to that Bond. Any person or entity indicating that they have a claim of nonpayment under this Payment Bond shall, upon written request, be promptly furnished a copy of the Bond and Construction Contract.

D. CHANGE ORDERS

The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. All Contract Change Orders involving an increase in the Contract

Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.

E. EXPIRATION

The obligations of the Surety for the Performance Bond shall be coextensive with the Contractor's performance obligations under the Contract Documents; provided, however, that the Surety's obligation under that Bond shall expire at the end of the one-year warranty period(s) in Article 35.

ARTICLE 39
NO ASSIGNMENT WITHOUT OWNER CONSENT

The Contractor shall not assign any benefit, monies due, obligation, responsibility, or right under the Contract, or subcontract any part of the Work to a Subcontractor, in whole or part, without prior written consent of the City, which consent may be withheld for any reason. Any authorized Subcontractors shall comply with the applicable provisions of the principal Contract, and the Contractor shall be fully responsible for the acts and omissions of its Subcontractors. In no event may Contractor assign its benefits or responsibilities of the Contract to an interested contractor who was determined by the Owner to not be a responsible bidder in the competitive bidding process for the Project.

ARTICLE 40
CONSTRUCTION by OWNER or SEPARATE CONTRACTORS

A. OWNER'S RESERVATION of RIGHT

The Owner reserves the right to self-perform operations or construction work through its own forces as may be needed for the Project, or to award separate contracts to third parties for that work for portions of the Project. The contractual conditions of any separate contracts with third parties for those operations shall be substantially similar to those in this Contract. If the Contractor has good reason to contend that any actions or operations of the Owner or contractors operating under separate contracts result in delay or additional cost under this Contract, it may provide notification and assert such claims as provided in Article 20 and Article 23.

B. COORDINATION

Unless otherwise provided in the Contract Documents, the Owner shall be responsible for coordinating the activities of the Owner's forces and separate contractors with the Work of the Contractor in a manner that will not interfere with the operations of the Contractor under this Contract. The Contractor shall cooperate with the Owner and separate contractors, shall participate in reviewing and comparing their construction schedules relative to that of the

Contractor when directed to do so, and shall make and adhere to any revisions to the construction schedule resulting from a joint review and mutual agreement.

ARTICLE 41
SUBCONTRACTS

A. APPROVAL of SUBCONTRACTS and OTHER CONTRACTS for PORTIONS of the WORK

(1) Unless otherwise provided in the Contract Documents, when delivering the executed Construction Contract, bonds, and evidence of insurance to the Architect, the Contractor shall also submit a listing of Subcontractors proposed for each principal portion of the Work and fabricators or suppliers proposed for furnishing materials or equipment fabricated to the design of the Contract Documents. This listing shall be in addition to any naming of Subcontractors, fabricators, or suppliers that may have been required in the bid process. The Architect will promptly reply to the Contractor in writing stating whether or not the Owner, after due investigation, has reasonable objection to any Subcontractor, fabricator, or supplier proposed by the Contractor. The issuance of the Notice to Proceed in the absence of such objection by the Owner shall constitute notice that no reasonable objection to them is made.

(2) The Contractor shall not contract with a proposed Subcontractor, fabricator, or supplier to whom the Owner has made reasonable and timely objection. Except in accordance with prequalification procedures as may be contained in the Contract Documents, through specified qualifications, or on the grounds of reasonable objection, the Owner may not restrict the Contractor's selection of Subcontractors, fabricators, or suppliers.

(3) Upon the Owner's reasonable objection to a proposed Subcontractor, fabricator, or supplier, the Contractor shall promptly propose another to whom the Owner has no reasonable objection. If the proposed Subcontractor, fabricator, or supplier to whom the Owner made reasonable objection was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be equitably adjusted by Contract Change Order for any resulting difference if the Contractor has acted promptly and responsively in this procedure.

(4) The Contractor shall not change previously selected Subcontractors, fabricators, or suppliers without notifying the Architect and Owner in writing of proposed substitute Subcontractors, fabricators, or suppliers. If the Owner does not make a reasonable objection to a proposed substitute within seven working days, the substitute shall be deemed approved.

B. SUBCONTRACTUAL RELATIONS

(1) The Contractor agrees to bind every Subcontractor and material supplier (and require every Subcontractor to so bind its subcontractors and material suppliers) to all the provisions of the Contract Documents as they apply to their portion of the Work.

(2) Nothing contained in the Contract Documents shall be construed as creating any contractual relationship between any Subcontractor and the Owner or between any

Subcontractor and the Architect, nor to create a duty for the Owner or Architect to interject themselves into dealings between or among the Contractor or its Subcontractors and suppliers or resolve any disputes between them.

ARTICLE 42
ARCHITECT'S STATUS

- A. The Architect is an independent contractor performing which, with respect to this Contract and Project, is performing professional design services pursuant to an agreement between the Owner and the Architect. The Architect has prepared the Drawings and Specifications and assembled the Contract Documents, and therefore is charged with their interpretation and clarification as described in those Documents. The Architect will endeavor to guard the Owner against variances from the requirements of the Contract Documents by the Contractor, and on behalf of the Owner, the administer the Contract as described in the Contract Documents during construction and the Contractor's one-year warranty period.
- B. To maintain continuity in administration of the Contract and to facilitate complete documentation of the Project record, all communications between the Contractor and Owner regarding matters of or related to the performance of the Work shall be directed through the Architect, unless direct communication is otherwise required to provide a legal notification. Unless otherwise authorized by the Architect, communications by and between the Contractor with the Architect's consultants shall be through the Architect. Unless otherwise authorized by the Contractor, communications between the Contractor and its Subcontractors and material suppliers shall be through the Contractor.

C. ARCHITECT'S AUTHORITY

Subject to other provisions of the Contract Documents, the following summarizes some of the authority vested in the Architect by the Owner with respect to the Construction Contract and as further described or conditioned in other Articles of these General Conditions of the Contract.

(1) The Architect is authorized to:

- (a) approve "Minor" deviations as defined in Article 9, Submittals
- (b) make "minor" changes in the Work as defined in Article 19, Changes in the Work
- (c) reject or require the correction of Defective Work,
- (d) require the Contractor to stop the performance of Defective Work,
- (e) adjust an Application for Payment by the Contractor pursuant to Article 30, Certification and Approval of payments, and
- (f) issue Notices to Cure pursuant to Article 27.

(2) The Architect is not authorized to:

- (a) revoke, alter, relax, or waive any requirements of the Contract Documents (other than "Minor" deviations and changes) without concurrence of the Owner,

- (b) finally approve or accept any portion of the Work without concurrence of the Owner,
- (c) issue instructions contrary to the Contract Documents,
- (d) issue Notice of Termination or otherwise terminate the Contract, or
- (e) require the Contractor to stop the Work except only to avoid the performance of Defective Work.

D. LIMITATIONS of RESPONSIBILITIES

- (1) The Architect shall not be responsible to Contractors or others for supervising or coordinating the performance of the Work, for the Construction Methods or for the safety of the Work, unless the Contract Documents give other specific instructions concerning these matters.
- (2) The Architect will not be responsible to the Contractor (nor the Owner) for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents or for acts or omissions of the Contractor, a Subcontractor, or anyone for whose acts they may be liable. However, the Architect will report to the Owner and Contractor any Defective Work recognized by the Architect.
- (3) The Architect will endeavor to secure faithful performance of the Contract by Owner and Contractor, and the Architect will not show partiality to either or be liable to either for results of interpretations or decisions rendered in good faith.
- (4) The Contractor agrees that the Architect and its consultants are not employed or retained by, or in a contractual relationship with the Contractor. Consequently, the Contractor's sole remedies arising from actions of the Architect (or its employees or consultants) are its rights to claim additional Contract Time or adjust the Contract Sum as provided hereunder and pursue those claims in accordance with Article 24. The Contractor shall have no claim or cause of action against the Architect (or its consultants) for any actions or failures to act by them related to the Project or Contract, whether such claim may be in contract, tort, strict liability, or otherwise. The Architect and Architect's consultants shall be considered third party beneficiaries of this provision of the Contract and entitled to enforce same.

E. ARCHITECT'S DECISIONS

Decisions by the Architect shall be in writing. The Architect's decisions on matters relating to aesthetic effect will be final and binding if consistent with the intent expressed in the Contract Documents. The Architect's decisions regarding disputes and claims arising between the Contractor and Owner shall be advisory.

ARTICLE 43
CASH ALLOWANCES

- A. All allowances stated in the Contract Documents shall be included in the Contract Sum. Items of work covered by allowances shall be supplied by the Contractor as directed by the Architect or Owner, or Owner, at its election, may pursue the economy of obtaining competitive pricing from responsible bidders for allowance items unless other purchasing procedures are specified in the Contract Documents.
- B. Unless otherwise provided in the Contract Documents:
- (1) allowances shall cover the cost to the Contractor of materials and equipment delivered to the Project site and all applicable taxes, less applicable trade discounts;
 - (2) the Contractor's costs for unloading, storing, protecting, and handling at the site, labor, installation, overhead, profit and other expenses related to materials or equipment covered by an allowance shall be included in the Contract Sum but not in the allowances;
 - (3) if required, the Contract Sum shall be adjusted by Change Order to reflect the actual costs of an allowance.
- C. Any selections of materials or equipment required of the Architect or Owner under an allowance shall be made in sufficient time to avoid delay of the Work.

ARTICLE 44
PERMITS, LAWS, and REGULATIONS, SALES TAX EXWMPION

A. PERMITS, FEES AND NOTICES

- (1) Unless otherwise provided in the Contract Documents, the Contractor, at its expense, shall secure and pay for the building permit and other permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the Work which are customarily secured after award of the Construction Contract and which are in effect on the date of receipt of bids.
- (2) The Contractor shall comply with and give notices required by all laws, ordinances, rules, regulations, and lawful orders of public authorities applicable to the lawful performance of the Work.

B. SALES TAX EXEMPTION.

Unless stated otherwise in the Contract Documents, materials incorporated into the Work are exempt from sales and use tax pursuant to Section 40-9-33, Code of Alabama, 1975 as amended. The Owner, Contractor and its subcontractors shall be responsible for complying with rules and regulations of the Sales, Use, & Business Tax Division of the Alabama

Department of Revenue regarding obtaining certificates and other qualifications necessary to claim such exemption when making qualifying purchases from vendors, or reach agreement on an Sales & Use Tax Agency or other arrangement that will secure the benefit of this exemption for the Project. If those certificates or arrangements for tax exempt purchases are not made, the Contractor shall pay all applicable taxes that are not covered by the exemption of Section 40-9-33 and which are imposed as of the date of receipt of bids, including those imposed as of the date of receipt of bids but scheduled to go into effect after that date.

C. COMPLIANCE WITH IMMIGRATION LAW

Contractor represents and warrants that (a) it does not knowingly employ, hire for employment, or continue to employ an “unauthorized alien,” as defined by the *Beason-Hammon Alabama Taxpayer and Citizen Protection Act*, Act No. 2011-535 (H. B. 56), as amended from time to time (the “Act”) and that, during the performance of this Agreement, it shall participate in the E-Verify program as required under the terms of the Act; (b) it will comply with all applicable provisions of the Act with respect to its contractors by entering into an agreement with or by obtaining an affidavit from such contractors providing that such contractors are in compliance with the Act with respect to their participation in the E-verify program; and (c) it shall not hire, retain or contract with any contractor that it knows is not in compliance with the Act. The Contractor further agrees and warrants that it will fully comply with the Immigration Reform and Control Act of 1986, as amended by the Immigration Act of 1990, in its hiring and employment practices, and that if it receives actual knowledge of the unauthorized status of one of its employees in the State of Alabama, it will remove that employee from the Project, jobsite or premises of the City and shall require each of its subcontractors, or other parties with whom it has a contract, to act in a similar fashion. If the Contractor violates any term of this paragraph, this Contract will be subject to immediate termination by the City. To the fullest extent permitted by law, Contractor shall defend, indemnify and hold harmless the City from any and all losses, consequential damages, expenses (including, but not limited to, attorneys' fees), claims, suits, liabilities, fines, penalties, and any other costs arising out of or in any way related to Contractor's failure to fulfill its obligations contained in this paragraph.

D. ALABAMA BOYCOTT LAW

Contractor makes the following representations pursuant to Act 2016-312 as codified in Title 41, Chapter 16, Article 1, of the Code of Alabama, 1975, as amended:

The Contractor affirms that it is not currently engaged in, and for the duration of the Contract will not engage in, the boycott of a person or an entity based in or doing business with a jurisdiction with which this state can enjoy open trade.

ARTICLE 45
ROYALTIES, PATENTS, and COPYRIGHTS

The Contractor shall pay all royalties and license fees related to equipment, devices and materials that is utilized on or incorporated into the Project. The Contractor shall defend, indemnify and hold harmless the Owner, Architect, Architect's consultants, and their agents, employees, and consultants from and against all claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of, related to, or resulting from all suits or claims for infringement of any patent rights or copyrights arising out of the inclusion of any patented or copyrighted materials, methods, or systems selected by the Contractor and used during the execution of or incorporated into the Work. This indemnification does not apply to any suits or claims of infringement of any patent rights or copyrights arising out of any patented or copyrighted materials, methods, or systems specified in the Contract Documents. However, if the Contractor has information that a specified material, method, or system is or may constitute an infringement of a patent or copyright, the Contractor shall be responsible for any resulting loss unless such information is promptly furnished to the Architect.

ARTICLE 46
USE of the SITE

- A. The Contractor shall confine its operations at the Project site to areas permitted by the Owner and by law, ordinances, permits and the Contract Documents, and shall not unreasonably encumber the site with materials, equipment, vehicles, or debris. The Contractor's operations at the site shall be restricted to the sole purpose of constructing the Work, use of the site as a staging, assembly, or storage area for other business which the Contractor may undertake shall not be permitted.
- B. Unless otherwise provided in the Contract Documents, temporary facilities such as storage sheds, shops, and offices may be erected on the Project site with the approval of the Architect and Owner. Such temporary buildings and/or utilities shall remain the property of the Contractor, and be removed at the Contractor's expense upon completion of the Work, unless the Owner authorizes their abandonment without removal.

ARTICLE 47
CUTTING and PATCHING

- A. The Contractor shall be responsible for all cutting, fitting, or patching that may be required to execute the Work to the results indicated in the Contract Documents or to make its parts fit together properly.
- B. Any cutting, patching, or excavation by the Contractor shall be supervised and performed in a manner that will not endanger persons nor damage or endanger the Work or any fully or partially completed construction of the Owner or separate contractors.

ARTICLE 48
IN-PROGRESS and FINAL CLEANUP

A. IN-PROGRESS CLEAN-UP

(1) The Contractor shall at all times during the progress of the Work keep the premises and surrounding area free from rubbish, scrap materials and debris resulting from the Work. Trash and combustible materials shall not be allowed to accumulate inside buildings or elsewhere on the premises. At no time shall any rubbish be thrown from window openings of any building or structure. Burning of trash and debris on site is not permitted.

(2) The Contractor shall make provisions to minimize and confine dust and debris resulting from construction activities.

B. FINAL CLEAN-UP

(1) Before Substantial Completion or Final Acceptance is achieved, the Contractor shall have removed from the Owner's property all construction equipment, tools, and machinery; temporary structures and/or utilities including the foundations thereof (except such as the Owner permits in writing to remain); rubbish, debris, and waste materials; and all surplus materials, leaving the site clean and true to line and grade, and the Work in a safe and clean condition, ready for use and operation.

(2) In addition to the above, unless otherwise provided in the Contract Documents, the Contractor shall be responsible for the following special cleaning operations for all trades as the Work is completed that are applicable to the Project:

- (a) Cleaning of all painted, enameled, stained, or baked enamel work: Removal of all marks, stains, finger prints and splatters from such surfaces.
- (b) Cleaning of all glass: Cleaning and removing of all stickers, labels, stains, and paint from all glass, and the washing and polishing of same on interior and exterior.
- (c) Cleaning or polishing of all hardware: Cleaning and polishing of all hardware.
- (d) Cleaning all tile, floor finish of all kinds: Removal of all splatters, stains, paint, dirt, and dust, the washing and polishing of all floors as recommended by the manufacturer or required by the Architect.
- (e) Cleaning of all manufactured articles, materials, fixtures, appliances, and equipment: Removal of all stickers, rust stains, labels, and temporary covers, and cleaning and conditioning of all manufactured articles, material, fixtures, appliances, and electrical, heating, and air conditioning equipment as recommended or directed by the manufacturers, unless otherwise required by the Architect; blowing out or flushing out of all foreign matter from all equipment, piping, tanks, pumps, fans, motors, devices, switches, panels, fixtures, boilers, sanitizing potable water systems; and freeing identification plates on all equipment of excess paint and the polishing thereof.

C. OWNER'S RIGHT to CLEAN-UP

If the Contractor fails to comply with these clean-up requirements and then fails to comply with a written directive by the Architect to clean-up the premises within a specified time, the Architect or Owner may implement appropriate clean-up measures and the cost thereof shall be deducted from any amounts due or to become due the Contractor.

ARTICLE 49
LIQUIDATED DAMAGES

- A. Time is the essence of the Contract. Any delay in the completion of the Work required by the Contract Documents may cause inconvenience to the public and loss and damage to the Owner including, but not limited to, interest and additional charges for administration, supervision, architectural, engineering and inspection which is required because the Project is not completed at the contemplated time. By executing the Construction Contract, the Contractor agrees that the Contract Time is sufficient for the achievement of Substantial Completion.
- B. The Construction Contract may provide for a certain dollar amount for which the Contractor and its Surety (if any) will be liable to the Owner as liquidated damages for each calendar day after expiration of the Contract Time that the Contractor fails to achieve Substantial Completion of the Work. If such daily liquidated damages are provided for, Owner and Contractor, and its Surety, agree as follows. The actual damages that will flow from Contractor's failure to timely complete the Work would be difficult to estimate or prove. Therefore, the parties agree that the stipulated Liquidated Damages amounts (i) are reasonable, (ii) are designed to compensate the Owner for the Contractor's failure to timely perform the Project, (iii) are not penalties or intended as punishment, and (iv) are intended to compensate the City for the above noted inconvenience. loss and damage. Moreover, if the City permits the Contractor to continue and finish the Work (or any part of it) after the time for performance has expired, the performance of that delayed work will not waive, diminish or impact the City's rights to assess Liquidated Damages.
- C. The amount of liquidated damages assessable on the Project may be deducted by the Owner from the moneys otherwise due the Contractor in the Final Payment, and that amount may be recovered from Contractor or its Surety. If part of the Work is substantially completed within the Contract Time and part is not, the stated charge for Liquidated Damages shall be equitably prorated to that portion of the Work that the Contractor fails to substantially complete within the Contract Time.

END of
GENERAL CONDITIONS of the CONTRACT

EXHIBIT E - Supplementary and Technical Specifications

Item 1. Drainage Improvements

Below is a description of Item 1 of the Work that is to be installed at the Project Site, and the conditions related to this installation. On EXHIBIT A the bidder shall enter its Lump Sum price for Drainage Improvements to be used in such operations, and its total bid price to install Item 1.

1.01 SCOPE

The Work includes, but is not limited to, the installation of gabion baskets along drainage ditch, various new storm structures and pipes, new landscape hardscape and plantings, and utility upgrades. This includes but is not limited to the demolition, removal and disposal of an existing culverts, earthwork, rock excavation of any type, rebuilding and replacing existing curb inlets, the cost of the new culverts, stormwater management, traffic control, clearing and grubbing, new gabion systems, concrete, erosion control, any cleanup and haul off required, replacement of the asphalt and all existing hardscape and landscape, all backfill, including stone backfill, relocation of existing utilities, and all other items necessary to complete the Work as described in the plans and specifications.

1.02 BASIS OF PAYMENT

Payment for the Item 1 operations shall be made on a lump sum basis to perform this work per the drawings and specifications.

Item 2. Alabama Power Line Relocates

Below is a description of Item 2 of the Work that is to be performed at the Project Site, and the conditions related to this installation. On EXHIBIT A an allowance has been entered that will be included in the total bid price.

1.01 SCOPE

The Work includes the cost for Alabama Power to relocate a part of the power lines or guy wires. The contractor will be required to coordinate this with the Work.

1.02 BASIS OF PAYMENT

Payment for the Item 2 operations shall be made on a lump sum basis to perform this work per the drawings and specifications. The allowance amount of \$ 3,810 includes the quoted amount of \$3,312.31 from Alabama Power plus 15% profit and overhead. Should the final invoice amount from Alabama Power exceed \$3,312.31, then an adjustment will be made to the contract through a change order in accordance with the Contract.

TECHNICAL SPECIFICATIONS
CIVIL ENGINEERING PACKAGE

Mountain Ln and Montevallo Ln Area Drainage Improvements

Mountain Brook, Alabama

April 2024

PREPARED BY

SCHOEL ENGINEERING COMPANY, INC.
1001 22ND STREET SOUTH | BIRMINGHAM, AL 35205 | (205) 323-6166

Mountain Ln and Montevallo Ln Area Drainage Improvements

TABLE OF CONTENTS

SECTION NO. AND TITLE

311000	Site Clearing
312000	Earth Moving
312319	Dewatering
312500	Erosion and Sedimentation Controls
321216	Asphalt Paving
321313	Concrete Paving
321373	Concrete Paving Joint Sealants
321723	Pavement Markings
330500	Common Work Results for Utilities
331415	Site Water Distribution Piping
333000	Sanitary Sewage Utilities
334200	Stormwater Conveyance

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protecting existing trees and vegetation to remain.
2. Removing existing trees and vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, and removing site utilities.
8. Disconnecting, capping or sealing, and abandoning site utilities in place.

B. Related Requirements:

1. Section 312500 "Erosion and Sedimentation Controls" for temporary erosion- and sedimentation-control measures.
2. Section 312000 Earth Moving.

1.3 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil. It is generally clay loam surface soil found in a depth not less than 4 inches. It is reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; and free of weeds, roots, toxic materials, or other nonsoil or objectionable materials.
- D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

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- E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.
- F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or video recordings.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Topsoil stripping and stockpiling program.
- C. Rock stockpiling program.
- D. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions per Contract Closeout Checklist.

1.7 QUALITY ASSURANCE

- A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.
- B. Rock Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.8 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

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1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
1. Do not proceed with work on adjoining property until directed by Engineer.
- C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- F. Tree- and Plant-Protection Zones: Protect according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- G. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- C. Protect existing site improvements to remain from damage during construction.
1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- C. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.
 - 1. Do not store construction materials, debris, or excavated material within drip line.
 - 2. Do not permit vehicles, equipment, or foot traffic within drip line.
- D. Do not excavate within drip line of trees, unless otherwise indicated.
- E. Where excavation is within drip line, hand clear and excavate to minimize damage to root system. Use narrow-tine spaces; comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
 - 1. Cover exposed roots with burlap and water regularly.
 - 2. Support and protect roots until covered with soil.
 - 3. Coat cut face of roots with emulsified asphalt.
 - 4. Backfill with soil as soon as possible.
- F. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in manner approved by Engineer.
 - 1. Employ qualified arborist, licensed in jurisdiction of project, to repair damage to trees and shrubs.
 - 2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.4 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities. Pay any required fees.
 - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- B. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- C. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.
- D. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Grind down stumps and remove roots larger than 2 inches (50 mm) in diameter, obstructions, and debris to a depth of 18 inches (450 mm) below exposed subgrade.
 - 3. Use only hand methods or air spade for grubbing within protection zones.
 - 4. Chip removed tree branches and dispose of off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm) and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

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1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.

3.7 STOCKPILING ROCK

- A. Remove from construction area naturally formed rocks that measure more than 1 foot (300 mm) across in least dimension. Do not include excavated or crushed rock.
 1. Separate or wash off non-rock materials from rocks, including soil, clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.
- B. Stockpile rock away from edge of excavations without intermixing with other materials. Cover to prevent windblown debris from accumulating among rocks.
 1. Limit height of rock stockpiles to 36 inches (900 mm).
 2. Do not stockpile rock within protection zones.
 3. Stockpile surplus rock to allow later use by the Owner unless directed by owner to dispose.

3.8 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. No burning shall be permitted on site.
- C. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes unclassified excavation, grading, and fill as shown or specified, all as part of Base Bid, and:

1. Site excavation as shown or indicated, including removal of rock, rock deposits, boulders, organic material, soil or any other material to reach grade, subgrade, footing or trench bottom, or other condition indicated.
2. Coordinate work with Owner's Geotechnical Engineer.
3. Grade in stages if required to install new or modify existing utilities.
4. Scarify, compact, and test previously graded areas of site for acceptance before beginning work of this contract.
5. Excavate and place embankments to required line, grade, and elevation.
6. Prepare low areas for fill placement, including disposal of muck, silt, wet or unsuitable material.
7. Haul in satisfactory fill material, if satisfactory material is not available on site to provide site to line and grade shown.
8. Haul off excess excavation or unsatisfactory material, if material cannot be used on site to provide line and grade shown.
9. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
10. Excavating and backfilling for buildings and structures.
11. Drainage course for concrete slabs-on-grade.
12. Subbase course for concrete walks and pavements.
13. Subbase course and base course for asphalt paving.
14. Subsurface drainage backfill for walls and trenches.
15. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:

1. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
2. Section 312500 "Erosion and Sedimentation Controls" for temporary erosion and sedimentation control measures.

1.2 UNIT PRICES

- A. Work of this Section is affected by unit prices for earth moving specified in Section 012200 "Unit Prices."
- B. Quantity allowances for earth moving are included in Section 012100 "Allowances."

1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and walks or paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
 - 2. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, will be without additional compensation.
 - 4. Unclassified Excavation: **Excavation is unclassified**, which is defined as removal of any material encountered in reaching elevations or accomplishing the work shown on the drawings without regard to type or character; whether wet or dry; dark or light; dirt or rock; hard or soft; humus or no-humus; smelly or not smelly; heavy or light in weight.
- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other fabricated stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct pre-excavation conference at Project site.
 - 1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
 - a. Personnel and equipment needed to make progress and avoid delays.
 - b. Coordination of Work with utility locator service.
 - c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
 - d. Extent of trenching by hand or with air spade.
 - e. Field quality control.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 - 1. Controlled low-strength material, including design mixture.
- B. Samples for Verification: For the following products, in sizes indicated below:
 - 1. Proposed fill/backfill, 30-lb samples, sealed in airtight containers, from on-site or borrow sources.
 - 2. Geotextile: 12 by 12 inches (300 by 300 mm).

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: From a qualified testing agency for each on-site and borrow soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D2487.
 - 2. Laboratory compaction curve according to ASTM D698.
- C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.7 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.
- B. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

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1. Owner will employ independent geotechnical testing agency to verify that soils meet requirements and perform required field and laboratory tests. The contractor shall work with the testing agency to ensure that required testing and results are obtained.

1.8 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 1. Do not proceed with work on adjoining property until directed by Engineer.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations. Do not interrupt utilities serving Owner or others except when permitted in writing by Engineer and then only after acceptable temporary services are provided.
 1. Provide minimum 48-hour notice to Owner and receive written notice to proceed before interrupting any utility.
- D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 312500 "Erosion and Sedimentation Controls" are in place.
- E. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.
- F. The following practices are prohibited within protection zones:
 1. Storage of construction materials, debris, or excavated material.
 2. Parking vehicles or equipment.
 3. Foot traffic.
 4. Erection of sheds or structures.
 5. Impoundment of water.
 6. Excavation or other digging unless otherwise indicated.
 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487 or a combination of these groups; free of rock or gravel larger than 2 inches (75 mm) in any dimension, topsoil, organics, debris, waste, frozen materials, vegetation, and other deleterious matter.
 - 1. Liquid Limit: not exceeding 55
 - 2. Plasticity Index: not exceeding 25
 - 3. Maximum Dry Density: above 100 pcf
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487 or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
 - 2. Any material not meeting the requirements of Subsection 2.1 B.
- D. Provide engineered fill as required.
- E. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve; and conforming to the requirements of ALDOT Standard Specifications for Highway Construction Section 825-Type "B".
- F. Base Course: Naturally or artificially graded mixture of natural or crushed aggregate conforming to the requirements of ALDOT Standard Specifications for Highway Construction Section 825-Type "B".
- G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- H. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- I. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and zero to 5 percent passing a No. 8 (2.36-mm) sieve.
- J. Sand: ASTM C33/C33M; fine aggregate.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 CONTROLLED LOW-STRENGTH MATERIAL

- A. Controlled Low-Strength Material: Self-compacting, flowable concrete material produced from the following:
 - 1. Portland Cement: ASTM C150/C150M, Type I or Type II.
 - 2. Fly Ash: ASTM C618, Class C or F.
 - 3. Normal-Weight Aggregate: ASTM C33/C33M, 3/4-inch (19-mm) nominal maximum aggregate size.
 - 4. Water: ASTM C94/C94M.
 - 5. Air-Entraining Admixture: ASTM C260/C260M.
- B. Produce conventional-weight, controlled low-strength material with 140-psi (965-kPa) compressive strength when tested according to ASTM C495/C495M.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

- A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
- B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- C. Protect areas receiving fill, subgrades, and foundation soils from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
- D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.
- E. Additional specifications for dewatering systems are provided in Section 312319 Dewatering.

3.3 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches (600 mm) outside of concrete forms other than at footings.
 - b. 12 inches (300 mm) outside of concrete forms at footings.
 - c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
 - f. 6 inches (150 mm) beneath pipe in trenches and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

3.4 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 0.10 inches (2.54 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 2. Pile Foundations: Stop excavations 6 to 12 inches (150 to 300 mm) above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
 3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 0.10 inches (2.54 mm). Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: 12 inches (300 mm) each side of pipe or conduit.
- C. Trench Bottoms:
 - 1. Excavate trenches 6 inches (152 mm) deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
 - 2. Sanitary and Storm Sewers shall receive No. 8910 or No. 610 stone bedding.
- D. Trenches in Tree- and Plant-Protection Zones:
 - 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
 - 3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.7 SUBGRADE INSPECTION

- A. Notify Geotechnical Engineer when excavations have reached required subgrade.
- B. If Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade with a heavy pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes) to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
 - 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed.

Schoel Engineering

- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.
- F. Any voids deeper than the cut line created by structure demolition operations shall be backfilled and compacted with engineered fill. This shall be considered authorized additional excavation and paid for according to Contract provisions for unit prices.

3.8 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Engineer.
 - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Engineer.
- B. Where indicated width of utility trench is exceeded, provide stronger pipe or special installation procedures as required by the Engineer.

3.9 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees. If there is not sufficient area for onsite stockpiles, Contractor shall provide storage offsite at no additional cost to the Owner.

3.10 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Acceptance of construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for Record Documents.
 - 3. Testing and inspecting underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring, bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."
- D. Trenches under Roadways: Provide 4-inch (100-mm) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 033000 "Cast-in-Place Concrete."
- E. Backfill voids with satisfactory soil or approved backfill materials while removing shoring, bracing, and sheeting.
- F. Initial Backfill:
 - 1. Soil Backfill: Place and compact initial backfill of subbase material or satisfactory soil, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.
 - a. Where sewers, water lines, etc. are to be under paving or other improvements they shall be backfilled full depth with No. 8910 or No. 610 stone. If sewer is located in fill and backfill is 6 ft or greater from the top of pipe to finished subgrade, backfill in accordance with paragraph above.
 - b. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
 - 2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches (300 mm) over the pipe or conduit. Coordinate backfilling with utilities testing.
- G. Final Backfill:
 - 1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
 - 2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.
- H. Warning Tape: Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.12 SOIL FILL

- A. Remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground before placing fills. Areas receiving fill shall be proof rolled in the presence of the Geotechnical Engineer prior to fill placement. Areas identified as unacceptable by the Geotechnical Engineer shall be excavated (undercut) and backfilled prior to fill placement.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material or subbase or base material.
 - 3. Under steps and ramps, use subbase material.
 - 4. Under building slabs, use drainage course over subgrade as shown and engineered fill to bring to subgrade.
 - 5. Under footings and foundations, use engineered fill.
- D. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.13 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D698:
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 98 percent.

2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 98 percent.
 3. Under turf or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 95 percent.
 4. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.
- D. Crushed stone fill placed directly under the building pads, in utility trenches, and under sidewalks shall be compacted to 95 percent Modified Proctor ASTM-D-1557.
- E. Embankment layers that are composed predominantly of rock (approximately 70 percent) shall be rolled until firm to the satisfaction of the project's Geotechnical Engineer.

3.15 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
1. Turf or Unpaved Areas: Plus or minus 2 inches (50 mm).
 2. Walks: Plus or minus 1 inch (25 mm).
 3. Pavements: Plus or minus 1/2 inch (13 mm).
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.
- D. The upper 3 feet of all subgrade areas shall contain satisfactory soil material. No rock material will be permitted. This may require over excavation and backfill in areas of rock cut. This will allow for the installation of utilities and finish grading activities.

3.16 SUBSURFACE DRAINAGE

- A. See section 334200 "Stormwater Conveyance."

3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 2. Place base course material over subbase course under hot-mix asphalt pavement or portland cement concrete paving.
 3. Shape subbase course and base course to required crown elevations and cross-slope grades.
 4. Place subbase course and base course 6 inches (150 mm) or less in compacted thickness in a single layer.
 5. Place subbase course and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
 6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 100 percent of maximum dry unit weight according to ASTM D1557.
- C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 100 percent of maximum dry unit weight according to ASTM D1557.

3.18 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 2. Determine that fill material classification and maximum lift thickness comply with requirements.
 3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.
- E. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, and ASTM D6938, as applicable. Field density tests may be performed by nuclear method per ASTM D2922, provided calibration curves are adjusted to correlate to tests performed using ASTM D1556 or ASTM D2167. Check each calibration against curves furnished with moisture gages per ASTM D3017. Tests will be performed at the following locations and frequencies:

School Engineering

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab but in no case fewer than three tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 50 feet (15 m) or less of wall length but no fewer than two tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 50 feet (15 m) or less of trench length but no fewer than two tests.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.19 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Construction dewatering.

B. Related Requirements:

1. Section 312000 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review condition of site to be dewatered, including coordination with temporary erosion-control measures and temporary controls and protections.
3. Review geotechnical report.
4. Review proposed site clearing and excavations.
5. Review existing utilities and subsurface conditions.
6. Review observation and monitoring of dewatering system.

1.3 ACTION SUBMITTALS

A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer.

1. Include plans, elevations, sections, and details.
2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
4. Include written plan for dewatering operations, including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.

B. Delegated Design Submittals: For dewatering system, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Field Quality-Control Submittals:
 - 1. Field quality-control reports.
- B. Qualification Statements: For Installer and land surveyor.
- C. Delegated design engineer qualifications.
- D. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.
- E. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer: An experienced installer that has specialized in design of dewatering systems and dewatering work.
 - 2. Delegated Design Engineer: A professional engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of the type indicated.
 - 3. Land Surveyor: A professional land surveyor who is legally qualified to practice in state where Project is located.

1.6 FIELD CONDITIONS

- A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.
 - 1. Make additional test borings and conduct other exploratory operations necessary for dewatering in accordance with the performance requirements.
 - 2. The geotechnical report is referenced elsewhere in Project Manual.
- B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design dewatering system.
- B. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of groundwater and permit excavation and construction to proceed on dry, stable subgrades.
 - 1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
 - 2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
 - 3. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
 - 5. Remove dewatering system when no longer required for construction.
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
 - 1. Prevent surface water and subsurface or groundwater from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
 - 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Provide temporary grading to facilitate dewatering and control of surface water.

School Engineering

- D. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 312500 “Erosion and Sedimentation Controls” during dewatering operations.

3.2 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
 - 1. Space well points or wells at intervals required to provide sufficient dewatering.
 - 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Place dewatering system into operation to lower water to specified levels before excavating below groundwater level.
- C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.
- D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

- A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- B. Operate system to lower and control groundwater to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 - 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
 - 2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
 - 3. Maintain piezometric water level a minimum of 24 inches (600 mm) below bottom of excavation.
- C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.
- D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches (900 mm) below overlying construction.

3.4 FIELD QUALITY CONTROL

- A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.
 - 1. Observe and record daily elevation of groundwater and piezometric water levels in observation wells.
 - 2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
 - 3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.
- B. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.
- C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.
- D. Prepare reports of observations.

3.5 PROTECTION

- A. Protect and maintain dewatering system during dewatering operations.
- B. Promptly repair damages to adjacent facilities caused by dewatering.

END OF SECTION 312319

SECTION 312500 – EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes providing, establishing, and maintaining temporary erosion and sediment control work items which consist of measures indicated on drawings and as necessary during the life of the contract to control erosion and sedimentation on or beyond project limits.
- B. Related Requirements:
 - 1. Section 311000 Site Clearing
 - 2. Section 312000 Earth Moving.

1.3 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. General:
 - a. Current Federal, State, and Local Standards apply to this Project.
 - b. Listings: Issues listed by reference, including revisions of issuing authority, form part of this section to extent indicated. Issues listed are identified by number, edition, date, title, or other designation established by issuing authority. Issues subsequently referred to are by an issuing authority abbreviation and a basic designation.
 - c. Modifications: Modifications by Engineer to reference Standards if any are noted with standard.
 - 2. Alabama Department of Transportation (ALDOT), Standard Specifications for Highway Construction, Latest Edition.
 - 3. “Alabama Nonpoint Source Management Program” published by the Alabama Department of Environmental Management (ADEM), April 1989.
 - 4. Local Codes, Ordinances, Regulations.
- B. Pre-Construction Meeting: Before proceeding with site clearing operations, review site features to remain and be protected at the site with the Owner and Engineer.
- C. Site Damage: If any protection materials or measures are dismantled, removed, or altered, even temporarily, or if areas of the site designated to remain are utilized in any manner without the

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Owner's written authorization, the Contractor agrees to pay the Owner five hundred dollars (\$500.00) per infraction, as determined by the Engineer, as fixed and liquidated damages.

PART 2 - PRODUCTS

2.1 HAY BALES

- A. Bales may be either hay or straw containing five cubic feet of material and weighing not less than 35 lbs.

2.2 SILT FENCE

- A. Silt fences approved by governing authorities, consist of a polymeric filter fabric mounted on posts with wire backing as shown on the drawings.

PART 3 - EXECUTION

3.1 EROSION AND SEDIMENTATION CONTROL

- A. General: Employ erosion and sediment control management practices as required. The contractor is responsible for obtaining all required permits for construction activity. The Contractor will be responsible for application and maintenance of all conditions required by the permits. The contractor will be responsible for all requirements of the permits until acceptance of all work under this contract.
 - 1. Control and abate water pollution, erosion and sedimentation at its potential source; employ downstream sediment entrapment measures as a backup to primary control at the source.
 - 2. Take all reasonable precautions to prevent and suppress fires and other detrimental occurrence which may be caused by construction operations.
 - 3. Protect streams and drainage systems from contamination by siltation or other harmful materials.
 - 4. The Contractor, his employees and subcontractors must use conservation practices during the work:
 - a. Comply with all State and local laws, rules and regulations for prevention and suppressive action for forest fires and for the prevention of pollution of streams and drainage ways.
 - b. Protect and preserve soil and vegetation cover on the property and on adjacent lands. Any disturbance of soil and vegetation cover outside the project area will not be permitted under any circumstances. Special consideration will be given to the protection of adjacent areas.
 - c. Prevent and control soil erosion and gulleying within the property covered by the Contract and the lands immediately adjacent as a result of construction.
 - d. Do not deposit waste, loose soil or other materials in live streams, swales or drainage ways.

School Engineering

- e. Do not allow fuels, oils, bitumen or other greasy or chemical substances originating from construction operations to enter or be placed where they may enter a live stream or drainage way. Service and repair equipment in selected areas as far as possible from streams and drainage ways.
 - f. Coordinate erosion and sedimentation control measures with the clearing and grubbing operation so both activities occur in the correct relation to one another.
 - g. Install and maintain erosion and sedimentation control measures (both temporary and permanent) as a continuing program until the site work is complete. This includes repairs, damage from storms, regular maintenance, removal and disposal of accumulated silt.
 - h. Protect downstream properties.
- B. Hay bales shall be anchored by use of stakes.
- C. Once installed, maintain silt fence until its capacity has been reached or erosion activity in the areas has been stabilized. When a silt fence has reached its capacity to function and need for a backup fence becomes evident, provide an additional line of silt fence. Repair of a damaged silt fence shall be accomplished by utilizing same type of materials used in original construction.
- D. Install and maintain erosion and sedimentation control measures as a continuing program until the site work is complete. This includes, repairs, damage from storms, regular maintenance and removal and disposal of accumulated silt.

3.2 MAINTENANCE

- A. Maintain erosion and sediment control features that have been installed. Maintenance of erosion and sediment control features will be considered as an incidental part of the work and no specific payment for this will be made.

END OF SECTION 312500

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Hot-mix asphalt paving.
2. Hot-mix asphalt overlay.
3. Cold milling of existing asphalt pavement.
4. Hot-mix asphalt patching.
5. Asphalt traffic-calming devices.
6. Asphalt surface treatments.
7. Wheel stops.

B. Related Requirements:

1. Section 311000 "Site Clearing" for demolition and removal of existing asphalt pavement.
2. Section 312000 "Earth Moving" for subgrade preparation, fill material, separation geotextiles, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
3. Section 321313 "Concrete Paving" for concrete pavement and for separate concrete curbs, gutters, and driveway aprons.
4. Section 321373 "Concrete Paving Joint Sealants" for joint sealants and fillers at pavement terminations.
5. Section 321723 "Pavement Markings" for pavement marking paint requirements.

1.3 DESCRIPTION OF WORK

- A. Extent of work is shown and includes hot-mixed asphalt paving over prepared subbase.
- B. Verify grades and elevations before beginning. Notify Engineer of discrepancies.
- C. Engineer may make minor field adjustments without additional cost.
- D. Construct subgrade per Section 312000 Earth Moving.

1.4 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt pavement per requirements of Alabama Department of Transportation (ALDOT) “Standard Specifications for Highway Construction” latest edition.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
 - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - b. Review condition of substrate and preparatory work performed by other trades.
 - c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
 - d. Review and finalize schedule for paving and related work. Verify availability of materials, paving installer’s personnel, and equipment required to execute work without delays.
 - e. Review inspection and test requirements, governing regulations, and proposed installation procedures.
 - f. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

1.6 ACTION SUBMITTALS

- A. Product Data: Include technical data and tested physical and performance properties for each product specified.
- B. Hot-Mix Asphalt Designs:
 - 1. Certification, by authorities having jurisdiction, of approval of each hot-mix asphalt design proposed for the Work.
- C. Samples for Verification: For the following product, in manufacturer's standard sizes unless otherwise indicated:
 - 1. Paving Geotextile: 12 by 12 inches (300 by 300 mm) minimum.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For paving-mix manufacturer and testing agency.
- B. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements. Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.
 - 1. Aggregates.

2. Asphalt binder.
3. Asphalt cement.
4. Cutback prime coat.
5. Emulsified asphalt prime coat.
6. Tack coat.
7. Fog seal.
8. Undersealing asphalt.

- C. Material Test Reports: Indicate and interpret test results for compliance of materials with requirements indicated.
- D. Field quality-control reports.

1.8 QUALITY ASSURANCE

- A. Engage experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that required and with record of successful in-service performance.
- B. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.
- C. Testing Agency Qualifications: Qualified in accordance with ASTM D3666 for testing indicated.
- D. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the “Standard Specifications for Highway Construction” of Alabama Department of Transportation (ALDOT) for asphalt paving work.
 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking material in original packages with seal unbroken and bearing manufacturer's labels containing brand name, type of material, date of manufacture, and directions for storage.
- B. Store in clean, dry, protected location per manufacturer's direction.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
 2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
 3. Slurry Coat: Comply with weather limitations in ASTM D3910.

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4. Asphalt Base Course and Binder Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 40 deg F (15.6 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: Shall be in accordance with ALDOT Section 801.10
- C. Fine Aggregate: Shall be in accordance with ALDOT Section 802.04
 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: ASTM D242, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

- A. Aggregate Base Course: Crushed aggregate per requirements of ALDOT Section 301 (825-Type B). Place to width and depth shown.
- B. Plant Mix Bituminous Base (Black Base): Aggregate and bituminous material hot mixed in plant per ALDOT Section 327, Mix 1.
- C. Asphalt Binder: Bituminous Concrete binder layer in accordance with ALDOT Section 424.
- D. Asphalt Cement: Shall be in accordance with ALDOT Section 804.02
- E. Prime Coat: Bituminous treatment Type A, full width per requirements of ALDOT Section 401.02 (a) 1 and ASTM D 2027; medium-curing cutback asphalt; MC-30, MC-70.
- F. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, per requirements of ALDOT Section 405.02.
- G. Fog Seal: ASTM D977 emulsified asphalt, or ASTM D2397/D2397M cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application per the requirements of ALDOT Section 402.
- H. Wearing course: Bituminous Concrete wearing course in accordance with ALDOT Section 424.
- I. Water: Potable.
- J. Undersealing Asphalt: ASTM D3141/D3141M; pumping consistency.

2.3 AUXILIARY MATERIALS

- A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires, asphalt shingles, or glass from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.
- B. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.
- C. Sand: ASTM D1073, Grade No. 2 or No. 3.
- D. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.
- E. Joint Sealant: ASTM D6690, Type II or III, hot-applied, single-component, polymer-modified bituminous sealant.
- F. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, approximately 6" high, 9" wide, and 84" long. Provide chamfered corners, drainage slots, and anchorage holes.
 - 1. Dowels: Galvanized steel, 3/4" x 10".

2.4 MIXES

- A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes meeting requirements of applicable sections of ALDOT's "Standard Specifications for Highway Construction" and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Base Course: Plant mixed, bituminous concrete base per requirements of ALDOT Section 424 (Max. RAP per ALDOT).
 - 3. Binder Course: Plant mixed, bituminous concrete binder per requirements of ALDOT Section 424 (Max. RAP per ALDOT).
 - 4. Surface Course: Plant mixed, meeting requirements of ALDOT Section 424 (Max. RAP per ALDOT).
- B. Emulsified-Asphalt Slurry: ASTM D3910, meeting requirements of ALDOT Section 402.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.

- B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Proceed with paving only after unsatisfactory conditions have been corrected. Notify Engineer in writing of any unsatisfactory conditions.

3.2 PREPARATION

- A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
 - 2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
 - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed.

3.3 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
 - 1. Mill to a depth of 3 inches (75 mm).
 - 2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
 - 3. Control rate of milling to prevent tearing of existing asphalt course.
 - 4. Repair or replace curbs, driveway aprons, manholes, and other construction damaged during cold milling.
 - 5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
 - 6. Patch surface depressions deeper than 1 inch (25 mm) after milling, before wearing course is laid.
 - 7. Handle milled asphalt material in accordance with approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."
 - 8. Keep milled pavement surface free of loose material and dust.
 - 9. Do not allow milled materials to accumulate on-site.

3.4 PATCHING

- A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.

Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
 - 1. Undersealing: Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseal pieces firmly.
 - 2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Placing Single-Course Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.
- E. Placing Two-Course Patch Material: Partially fill excavated pavements with hot-mix asphalt base course mix and, while still hot, compact. Cover asphalt base course with compacted layer of hot-mix asphalt surface course, finished flush with adjacent surfaces.

3.5 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.
 - 1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).
 - 1. Clean cracks and joints in existing hot-mix asphalt pavement.
 - 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
 - 3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.6 SURFACE PREPARATION

- A. Ensure that prepared subgrade has been proof-rolled and is ready to receive paving. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces.

- B. Herbicide Treatment: Apply herbicide in accordance with manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
 - 1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.
- C. Cutback Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.30 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 72 hours minimum. Comply with ALDOT Section 401.
 - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 - 2. Protect primed substrate from damage until ready to receive paving.
- D. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.30 gal./sq. yd. per inch depth (0.5 to 1.40 L/sq. m per 25 mm depth). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 72 hours minimum. Comply with ALDOT Section 401.
 - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 - 2. Protect primed substrate from damage until ready to receive paving.
- E. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m). Comply with ALDOT Section 405.
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.7 INSTALLATION OF PAVING GEOTEXTILE

- A. Apply tack coat uniformly to existing pavement surfaces at a rate of 0.20 to 0.30 gal./sq. yd. (0.8 to 1.2 L/sq. m).
- B. Place paving geotextile promptly in accordance with manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches (100 mm) and transverse joints 6 inches (150 mm).
- C. Protect paving geotextile from traffic and other damage, and place hot-mix asphalt overlay the same day.

3.8 HOT-MIX ASPHALT PLACEMENT

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - 1. Place hot-mix asphalt base course and binder course in number of lifts and thicknesses indicated.
 - 2. Place hot-mix asphalt surface course in single lift.
 - 3. Spread mix at a minimum temperature of 250 deg F (121 deg C).
 - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
 - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.
 - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches (25 to 38 mm) from strip to strip to ensure proper compaction of mix along longitudinal joints.
 - 2. Complete a section of asphalt base course and binder course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.9 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.
 - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
 - 3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
 - 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "sawed vertical face" method as described in AI's "The Asphalt Handbook."
 - 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 - 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.10 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 1. Average Density, Marshall Test Method: 96 percent of reference laboratory density in accordance with ASTM D6927, but not less than 94 percent or greater than 100 percent.
 2. Average Density, Rice Test Method: 92 percent of reference maximum theoretical density in accordance with ASTM D2041/D2041M, but not less than 90 percent or greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.11 ASPHALT TRAFFIC-CALMING DEVICES

- A. Construct hot-mix asphalt speed bumps and humps over compacted pavement surfaces. Apply a tack coat unless pavement surface is still tacky and free from dust. Spread hot-mix asphalt at a minimum temperature of 250 deg F (121 deg C).
 1. Tack Coat Application: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 2. Hot-Mix Asphalt: Same as pavement surface-course mix.
 3. Before installation, mill pavement that will be in contact with bottom of traffic-calming device. Mill to a depth of 1 inch (25 mm) from top of pavement to a clean, rough profile.
- B. Place and compact hot-mix asphalt to cross section indicated, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.12 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce thickness indicated within the following tolerances:
 - 1. Base Course and Binder Course: Plus or minus 1/2 inch (13 mm).
 - 2. Surface Course: Plus 1/4 inch (6 mm), no minus.
- B. Pavement Surface Smoothness: Compact each course to produce surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course and Binder Course: 1/4 inch (6 mm).
 - 2. Surface Course: 1/8 inch (3 mm).
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).
- C. Asphalt Traffic-Calming Devices: Compact and form asphalt to the shapes indicated and within a tolerance of plus or minus 1/8 inch (3 mm) of height indicated above pavement surface.

3.13 SURFACE TREATMENTS

- A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. (0.45 to 0.7 L/sq. m) to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.
- B. Slurry Seals: Apply slurry coat in a uniform thickness in accordance with ASTM D3910 and allow to cure. Comply with ALDOT Section 402.
 - 1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.14 WHEEL STOPS

- A. Securely attach wheel stops into pavement with not less than 2 galvanized steel dowels embedded in precast concrete at one-third points. Firmly bond each dowel to wheel stop and pavement.
 - 1. Extend upper portion of dowel 5" into wheel stop and lower portion a minimum of 5" into pavement.

3.15 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 - 1. Agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

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- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined in accordance with ASTM D3549/D3549M.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. Asphalt Traffic-Calming Devices: Finished height of traffic-calming devices above pavement will be measured for compliance with tolerances.
- F. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement in accordance with ASTM D979/D979M.
 - 1. Reference laboratory density will be determined by averaging results from 4 samples of hot-mix asphalt-paving delivered daily to site, prepared per ASTM D 6927, and compacted per job-mix specifications.
 - 2. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared in accordance with ASTM D2041/D2041M, and compacted in accordance with job-mix specifications.
 - 3. In-place density of compacted pavement will be determined by testing core samples in accordance with ASTM D1188 or ASTM D2726/D2726M.
 - a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than three cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method in accordance with ASTM D2950/D2950M and coordinated with ASTM D1188 or ASTM D2726/D2726M.
- G. Replace and compact hot-mix asphalt where core tests were taken.
- H. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.16 WASTE HANDLING

- A. General: Handle asphalt-paving waste in accordance with approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes exterior concrete paving including the following:
 - 1. Driveways.
 - 2. Roadways.
 - 3. Parking lots.
 - 4. Curbs, gutters, and curb inlets.
 - 5. Walks.
 - 6. Cast in place inlets, headwalls, flumes, etc.
- B. Related Requirements:
 - 1. Section 312000 "Earth Moving" for subgrade preparation, grading, and subbase course.
 - 2. Section 321373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.
 - 3. Section 321723 "Pavement Markings."

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 SYSTEM DESCRIPTION

- A. Provide Portland Cement concrete pavement per requirements of Alabama Department of Transportation (ALDOT) "Standard Specifications for Highway Construction" latest edition.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

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1. Review methods and procedures related to concrete paving, including but not limited to, the following:
 - a. Concrete mixture design.
 - b. Quality control of concrete materials and concrete paving construction practices.
2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete paving Subcontractor.
 - e. Manufacturer's representative of stamped concrete paving system used for stamped detectable warnings.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.
- C. Samples for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:
 1. Exposed Aggregate: 10-lb (4.5-kg) Sample of each mix.
- D. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer of stamped detectable warnings, ready-mix concrete manufacturer, and testing agency.
- B. Material Certificates: For the following, from manufacturer:
 1. Cementitious materials.
 2. Steel reinforcement and reinforcement accessories.
 3. Fiber reinforcement.
 4. Admixtures.
 5. Curing compounds.
 6. Applied finish materials.
 7. Bonding agent or epoxy adhesive.
 8. Joint fillers.
- C. Material Test Reports: For each of the following:

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1. Aggregates: Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

D. Field quality-control reports.

1.8 QUALITY ASSURANCE

A. Industry Standards and Specifications: Issues listed (including modifications designated) form a part of this specification to extent indicated by reference thereto. Hereinafter, issues are referred to by basic numerical designation only, and revisions (if any) are noted herein.

1. American Society for Testing and Materials:

- C91 Masonry Cement, Spec. for
- C136 Sieve or Screen Analysis of Fine and Coarse Aggregate for Masonry Mortar, Spec. for
- C144 Aggregate for Masonry Mortar, Spec. for
- C150 Portland Cement, Spec. for
- C207 Hydrated Lime for Masonry Purposes, Spec. for
- C404 Aggregates for Masonry Grout, Spec. for

B. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Stamped Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of stamped concrete paving systems.

D. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

E. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests must be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

F. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Engineer and not less than 96 inches (2400 mm) by 96 inches (2400 mm). Include full-size detectable warning.

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3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

1.10 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
 1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 2. Do not use frozen materials or materials containing ice or snow.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- C. Hot-Weather Concrete Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:
 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
 - 1. Use flexible or uniformly curved forms for curves with a radius of 100 feet (30.5 m) or less. Do not use notched and bent forms.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.
- C. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884/A884M, Class A, plain steel.
- D. Reinforcing Bars: ASTM A615/A615M, Grade 60 (Grade 420); deformed.
- E. Galvanized Reinforcing Bars: ASTM A767/A767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A615/A615M, Grade 60 (Grade 420) deformed bars.
- F. Epoxy-Coated Reinforcing Bars: ASTM A775/A775M or ASTM A934/A934M; with ASTM A615/A615M, Grade 60 (Grade 420) deformed bars.
- G. Steel Bar Mats: ASTM A184/A184M; with ASTM A615/A615M, Grade 60 (Grade 420) deformed bars; assembled with clips.
- H. Plain-Steel Wire: ASTM A1064/A1064M, as drawn.
- I. Deformed-Steel Wire: ASTM A1064/A1064M.
- J. Epoxy-Coated-Steel Wire: ASTM A884/A884M, Class A; coated, plain or deformed.
- K. Joint Dowel Bars: ASTM A615/A615M, Grade 60 (Grade 420) plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A767/A767M, Class I coating. Cut bars true to length with ends square and free of burrs.
- L. Epoxy-Coated, Joint Dowel Bars: ASTM A775/A775M; with ASTM A615/A615M, Grade 60 (Grade 420) plain-steel bars.
- M. Tie Bars: ASTM A615/A615M, Grade 60 (Grade 420); deformed.
- N. Hook Bolts: ASTM A307, Grade A (ASTM F568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

School Engineering

- O. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- P. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.
- Q. Zinc Repair Material: ASTM A780/A780M.

2.4 CONCRETE MATERIALS

- A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:
 - 1. Portland Cement: ASTM C150/C150M, Type I or Type II.
 - 2. Fly Ash: ASTM C618, Class C or Class F.
 - 3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C33/C33M, Class 4S, Class 4M, Class 1N, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 1-1/2 inches (38 mm), 1 inch (25 mm), 3/4 inch (19 mm) nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Air-Entraining Admixture: ASTM C260/C260M.
- D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 2. Retarding Admixture: ASTM C494/C494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- E. Color Pigment: ASTM C979/C979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

School Engineering

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Color-Crete; Euclid Chemical
 2. Color: As indicated by manufacturer's designation.
- F. Water: Potable and complying with ASTM C94/C94M.

2.5 FIBER REINFORCEMENT

- A. Synthetic Fiber, Monofilament Fibers: Monofilament polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C1116/C1116M, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.
1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. FiberForce 100 or 150; FiberForce
 - b. PSI Fiberstrand Multi-Mix 80; Euclid Chemical
 - c. PSI Fiberstrand 100 or 150; Euclid Chemical
- B. Synthetic Fiber, Fibrillated Fibers: Fibrillated polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C1116/C1116M, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.
1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. FiberForce 300 or 500; FiberForce
 - b. PSI Fiberstrand F; Euclid Chemical

2.6 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Eucobar; Euclid Chemical

- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.
 - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Kurez DR VOX; Euclid Chemical
 - b. Kurez W VOX; Euclid Chemical
 - c. Diamond Clear VOX; Euclid Chemical
 - d. Aqua-Cure VOX; Euclid Chemical
- F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 2, Class B, dissipating.
 - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Kurez VOX White Pigmented; Euclid Chemical

2.7 RELATED MATERIALS

- A. Joint Fillers: ASTM D1751, asphalt-saturated cellulosic fiber in preformed strips.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy-Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Pigmented Mineral Dry-Shake Hardener: Factory-packaged, dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.
 - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Surfex; Euclid Chemical
 - 2. Color: As indicated by manufacturer's designation.
- F. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch (9.5-mm) sieve and 85 percent retained on a No. 8 (2.36-mm) sieve.

2.8 STAMPED DETECTABLE WARNING MATERIALS

- A. Detectable Warning Stamp: Semirigid polyurethane mats with formed underside capable of imprinting detectable warning pattern on plastic concrete; perforated with a vent hole at each dome.
 - 1. Size of Stamp: One piece, matching detectable warning area shown on Drawings, 24 by 48 inches (610 by 1220 mm).
- B. Liquid Release Agent: Manufacturer's standard, clear, evaporating formulation designed to facilitate release of stamp mats.

2.9 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M), for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method. Do not use Owner's field quality-control testing agency as the independent testing agency.
 - 2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash or Pozzolan: 25 percent.
 - 2. Slag Cement: 50 percent.
 - 3. Combined Fly Ash or Pozzolan, and Slag Cement: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
 - 1. Air Content, 1-1/2-inch (38-mm) Nominal Maximum Aggregate Size: 5-1/2 percent plus or minus 1-1/2 percent.
 - 2. Air Content, 1-inch (25-mm) Nominal Maximum Aggregate Size: 6 percent plus or minus 1-1/2 percent.
 - 3. Air Content, 3/4-inch (19-mm) Nominal Maximum Aggregate Size: 6 percent plus or minus 1-1/2 percent.
- D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture; high-range, water-reducing admixture; high-range, water-reducing and retarding admixture; plasticizing and retarding admixture in concrete as required for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

School Engineering

- E. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd. (0.60 kg/cu. m).
- F. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.
- G. Concrete Mixtures: Normal-weight concrete.
 - 1. Compressive Strength (28 Days): 4000 psi (27.6 MPa).
 - 2. Maximum W/C Ratio at Point of Placement: 0.45
 - 3. Slump Limit: 3 inches (75 mm).
 - a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than 8 inches (200 mm) after adding admixture to plant- or site-verified, 2- to 3-inch (50- to 75-mm) slump.

2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Furnish batch certificates for each batch discharged and used in the Work.
 - 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
 - 1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph (5 km/h).
 - 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
 - 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) according to requirements in Section 312000 "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 INSTALLATION OF STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.
- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D3963/D3963M.
- G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap of adjacent mats.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
 - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
 - 2. Provide tie bars at sides of paving strips where indicated.

3. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 4. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
1. Locate expansion joints at intervals of 50 feet (15.25 m) unless otherwise indicated.
 2. Extend joint fillers full width and depth of joint.
 3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch (6-mm) or 3/8-inch (10-mm) radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
 - a. Tolerance: Ensure that grooved joints are within 3 inches (75 mm) way from centers of dowels.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 - a. Tolerance: Ensure that sawed joints are within 3 inches (75 mm) either way from centers of dowels.
 3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch (6-mm) or 3/8-inch (10-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 (ACI 301M) requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 (ACI 301M) by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer, or use bonding agent if approved by Engineer.
- I. Screed paving surface with a straightedge and strike off.
- J. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- K. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.
 - 1. If results are not approved, remove and replace with formed concrete.
- L. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
 2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
 3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 SPECIAL FINISHES

- A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in paving surface as follows:
 1. Immediately after float finishing, spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
 2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
 3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
 4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
- B. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on paving surface. Tamp aggregate into plastic concrete and float finish to entirely embed aggregate with mortar cover of 1/16 inch (1.6 mm).
 1. Spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
 2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.
 3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.

4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
- C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:
1. Uniformly spread 40 lb/100 sq. ft. (19.5 kg/10 sq. m) of dampened, slip-resistive aggregate over paving surface in two applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
 2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over paving surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.
 3. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
 4. After curing, lightly work surface with a steel-wire brush or abrasive stone and water to expose nonslip aggregate.
- D. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating, apply dry-shake materials to paving surface according to manufacturer's written instructions and as follows:
1. Uniformly spread dry-shake hardener at a rate of 100 lb/100 sq. ft. (49 kg/10 sq. m) unless greater amount is recommended by manufacturer to match paving color required.
 2. Uniformly distribute approximately two-thirds of dry-shake hardener over the concrete surface with mechanical spreader; allow hardener to absorb moisture and embed it by power floating. Follow power floating with a second application of pigmented mineral dry-shake hardener, uniformly distributing remainder of material at right angles to first application to ensure uniform color, and embed hardener by final power floating.
 3. After final power floating, apply a hand-troweled finish followed by a broom finish.
 4. Cure concrete with curing compound recommended by dry-shake hardener manufacturer. Apply curing compound immediately after final finishing.

3.9 INSTALLATION OF DETECTABLE WARNINGS

- A. Blockouts: Form blockouts in concrete for installation of detectable paving units specified in Section 321726 "Tactile Warning Surfacing."
1. Tolerance for Opening Size: Plus 1/4 inch (6 mm), no minus.
- B. Cast-in-Place Detectable Warning Tiles: Form blockouts in concrete for installation of tiles specified in Section 321726 "Tactile Warning Surfacing." Screed surface of concrete where tiles are to be installed to elevation, so that edges of installed tiles will be flush with surrounding concrete paving. Embed tiles in fresh concrete to comply with Section 321726 "Tactile Warning Surfacing" immediately after screeding concrete surface.
- C. Stamped Detectable Warnings: Install stamped detectable warnings as part of a continuous concrete paving placement and according to stamp-mat manufacturer's written instructions.
1. Before using stamp mats, verify that the vent holes are unobstructed.

2. Apply liquid release agent to the concrete surface and the stamp mat.
3. Stamping: While initially finished concrete is plastic, accurately align and place stamp mats in sequence. Uniformly load, gently vibrate, and press mats into concrete to produce imprint pattern on concrete surface. Load and tamp mats directly perpendicular to the stamp-mat surface to prevent distortion in shape of domes. Press and tamp until mortar begins to come through all of the vent holes. Gently remove stamp mats.
4. Trimming: After 24 hours, cut off the tips of mortar formed by the vent holes.
5. Remove residual release agent according to manufacturer's written instructions, but no fewer than three days after stamping concrete. High-pressure-wash surface and joint patterns, taking care not to damage stamped concrete. Control, collect, and legally dispose of runoff.

3.10 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.11 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 (ACI 117M) and as follows:

1. Elevation: 1/4 inch (6 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long; unlevelled straightedge not to exceed 1/4 inch (6 mm).
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches (13 mm per 300 mm) of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch (25 mm).
6. Vertical Alignment of Dowels: 1/4 inch (6 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches (6 mm per 300 mm) of dowel.
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C172/C172M will be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 5000 sq. ft. (465 sq. m) or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when it is 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C31/C31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C39/C39M; test one specimen at seven days and two specimens at 28 days.
 - a. A compressive-strength test to be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no

School Engineering

compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

- D. Test results to be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests to contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency will make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.

3.13 REPAIR AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Engineer.
- B. Drill test cores, where directed by Engineer, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.
2. Hot-applied joint sealants.
3. Cold-applied, fuel-resistant joint sealants.
4. Hot-applied, fuel-resistant joint sealants.
5. Joint-sealant backer materials.
6. Primers.

B. Related Requirements:

1. Section 321216 "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
2. Section 321313 "Concrete Paving" for constructing joints in concrete paving.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Concrete pavement joint sealants.
2. Joint-sealant backer materials.

- B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of joint sealant.

- C. Samples for Verification: Actual sample of finished products for each kind and color of joint sealant required.

1. Size: Joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Paving-Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.

School Engineering

3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For Installer and testing agency.
- B. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
- C. Compatibility and Adhesion Test Reports: From joint sealant manufacturer indicating the following:
 1. Materials forming joint substrates and joint-sealant backer materials have been tested for compatibility and adhesion with joint sealants.
 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- D. Product Test Reports: From a qualified testing agency indicating joint sealants comply with requirements, based on comprehensive testing of current product formulations.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 1. Installers: Entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Testing: Performed by a qualified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.8 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:

School Engineering

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain joint sealants from single manufacturer for each sealant type.

2.2 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backer materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.3 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D5893/D5893M, Type NS.
 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Sikasil-728 NS; Sika USA
 - b. Dowsil 888; Dow
 - c. Roadsaver Silicone-SL; Crafcro Inc.
- B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D5893/D5893M, Type SL.
 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dowsil 890-SL; Dow
- C. Multicomponent, Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, for Use T.
 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Sikaflex-2c NS EZ; Sika USA
 - b. MasterSeal NP 2; Master Builders

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- D. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C920, Type S, Grade P, Class 25, for Use T.
 - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Sikaflex-1c SL; Sika USA
 - b. Pourthane SL; W.R. Meadows
 - c. MasterSeal CR 125; Master Builders
- E. Multicomponent, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C920, Type M, Grade P, Class 25, for Use T.
 - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Sikaflex-2c SL; Sika USA
 - b. MasterSeal SL 2; Master Builders

2.4 HOT-APPLIED JOINT SEALANTS

- A. Hot-Applied, Single-Component Joint Sealant, Type I: ASTM D6690.
 - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. 1190; W.R. Meadows
 - b. #164; W.R. Meadows
- B. Hot-Applied, Single-Component Joint Sealant, Type I or Type II: ASTM D6690.
 - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. 3405; W.R. Meadows
 - b. ULTRASEAL 3405; Crafc0 Inc.
- C. Hot-Applied, Single-Component Joint Sealant, Type I, II, or III: ASTM D6690.
 - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. HI-SPEC; W.R. Meadows
 - b. 3405; W.R. Meadows

2.5 COLD-APPLIED, FUEL-RESISTANT JOINT SEALANTS

- A. Fuel-Resistant, Single-Component, Pourable, Modified-Urethane, Elastomeric Joint Sealant: ASTM C920, Type S, Grade P, Class 25, for Use T.

Schoel Engineering

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. MasterSeal CR 125; Master Builders

B. Fuel-Resistant, Multicomponent, Pourable, Modified-Urethane, Elastomeric Joint Sealant: ASTM C920, Type M, Grade P, Class 12-1/2 or 25, for Use T.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Sikaflex-2c SL; Sika USA

2.6 HOT-APPLIED, FUEL-RESISTANT JOINT SEALANTS

A. Hot-Applied, Fuel-Resistant, Single-Component Joint Sealants, Type I or Type II: ASTM D7116.

B. Hot-Applied, Fuel-Resistant, Single-Component Joint Sealants, Type III: ASTM D7116.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. SUPERSEAL LOW-MOD; Crafcro Inc.

2.7 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.8 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

- A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions.
- C. Install joint-sealant backers to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of joint-sealant backer materials.
 - 2. Do not stretch, twist, puncture, or tear joint-sealant backer materials.
 - 3. Remove absorbent joint-sealant backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install joint sealants immediately following backer material installation, using proven techniques that comply with the following:
 - 1. Place joint sealants so they fully contact joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

- E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants in accordance with the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
 - 1. Remove excess joint sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING AND PROTECTION

- A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.
- B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION 321373

SECTION 321723 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Painted markings applied to asphalt paving.
- 2. Painted markings applied to concrete surfaces.

- B. Related Requirements:

- 1. Section 321216 "Asphalt Paving" for asphalt paving surface preparation.
- 2. Section 321313 "Concrete Paving" for concrete paving surface preparation.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

- 1. Review methods and procedures related to marking asphalt paving or concrete surfaces including, but not limited to, the following:
 - a. Asphalt-paving or concrete-surface aging period before application of pavement markings.
 - b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

1.4 ACTION SUBMITTALS

- A. Product Data: Include technical data and tested physical and performance properties.

- 1. Pavement-marking paint, alkyd.
- 2. Glass beads.

- B. Shop Drawings:

- 1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
- 2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

School Engineering

- C. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches (200 mm) square.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the "Standard Specifications for Highway Construction" of Alabama Department of Transportation (ALDOT) for pavement-marking work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4.4 deg C) for alkyd materials, 55 deg F (12.8 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain pavement-marking paints from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.3 PAVEMENT-MARKING PAINT

- A. Pavement-Marking Paint, Alkyd: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type N; colors complying with FS TT-P-1952F.
 - 1. Color: White, Yellow, or Blue As indicated
- B. Glass Beads: In accordance with ALDOT Section 856.05 and AASHTO M 247.
 - 1. Roundness: Minimum 80 percent true spheres by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement-marking substrate is dry and in suitable condition to begin pavement marking in accordance with manufacturer's written instructions.
- B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Engineer.
- B. Allow asphalt paving or concrete surfaces to age for a minimum of 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).
 - 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to asphalt paving or concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
 - 2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal. (0.72 kg/L).

3.3 PROTECTING AND CLEANING

- A. Protect pavement markings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 321723

SECTION 330500 - COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Piping joining materials.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Sleeves.
 - 5. Identification devices.
 - 6. Grout.
 - 7. Flowable fill.
 - 8. Piped utility demolition.
 - 9. Piping system common requirements.
 - 10. Equipment installation common requirements.
 - 11. Painting.
 - 12. Concrete bases.
 - 13. Metal supports and anchorages.

1.3 DEFINITIONS

- A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- C. ABS: Acrylonitrile-butadiene-styrene plastic.
- D. CPVC: Chlorinated polyvinyl chloride plastic.
- E. PE: Polyethylene plastic.
- F. PVC: Polyvinyl chloride plastic.

School Engineering

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Dielectric fittings.
 - 2. Identification devices.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.8 COORDINATION

- A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.
- C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Section 033000 "Cast-in-Place Concrete."

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness, unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAgl, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Solvent Cements for Joining Plastic Piping:
 - 1. ABS Piping: ASTM D2235.
 - 2. CPVC Piping: ASTM F493.
 - 3. PVC Piping: ASTM D2564. Include primer according to ASTM F656.
 - 4. PVC to ABS Piping Transition: ASTM D3138.
- H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.2 TRANSITION FITTINGS

- A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
- B. Transition Couplings NPS 1-1/2 (DN 40) and Smaller:
 - 1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
 - 2. Aboveground Piping: Specified piping system fitting.

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- C. AWWA Transition Couplings NPS 2 (DN 50) and Larger:
 - 1. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.
- D. Plastic-to-Metal Transition Fittings:
 - 1. Description: CPVC, CPVC and PVC, PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint or threaded end.
- E. Plastic-to-Metal Transition Unions:
 - 1. Description: MSS SP-107, CPVC, CPVC and PVC, PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.
- F. Flexible Transition Couplings for Underground Nonpressure Drainage Piping:
 - 1. Description: ASTM C1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.3 DIELECTRIC FITTINGS

- A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.
- B. Dielectric Unions:
 - 1. Description: Factory fabricated, union, NPS 2 (DN 50) and smaller.
 - a. Pressure Rating: 250 psig (1725 kPa) at 180 deg F (82 deg C).
 - b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.
- C. Dielectric Flanges:
 - 1. Description: Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 (DN 65 to DN 100) and larger.
 - a. Pressure Rating: 175 psig (1200 kPa) minimum to 300 psig (2070 kPa).
 - b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Kits:
 - 1. Description: Nonconducting materials for field assembly of companion flanges, NPS 2-1/2 (DN 65) and larger.
 - a. Pressure Rating: 150 psig (1035 kPa) minimum.
 - b. Gasket: Neoprene or phenolic.
 - c. Bolt Sleeves: Phenolic or polyethylene.

School Engineering

d. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

1. Description: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 (DN 80) and smaller.
 - a. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
 - b. End Connections: Threaded.

F. Dielectric Nipples:

1. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.
 - a. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
 - b. End Connections: Threaded or grooved.

2.4 SLEEVES

- A. Mechanical sleeve seals for pipe penetrations are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- B. Galvanized-Steel Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- C. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, galvanized, plain ends.
- D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe Sleeves: ASTM D1785, Schedule 40.
- G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.5 IDENTIFICATION DEVICES

- A. General: Products specified are for applications referenced in other utilities Sections. If more than single type is specified for listed applications, selection is Installer's option.
- B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.
 1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
 2. Location: Accessible and visible.

School Engineering

- C. Stencils: Standard stencils prepared with letter sizes complying with recommendations in ASME A13.1. Minimum letter height is 1-1/4 inches (30 mm) for ducts, and 3/4 inch (20 mm) for access door signs and similar operational instructions.
 - 1. Material: Fiberboard or Brass.
 - 2. Stencil Paint: Exterior, oil-based, alkyd-gloss black enamel, unless otherwise indicated. Paint may be in pressurized spray-can form.
 - 3. Identification Paint: Exterior, oil-based, alkyd enamel in colors according to ASME A13.1, unless otherwise indicated.
- D. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.
- E. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-sensitive-vinyl type with permanent adhesive.
- F. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Full-band pipe markers, extending 360 degrees around pipe at each location.
- G. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.
- H. Lettering: Manufacturer's standard preprinted captions as selected by Engineer.
- I. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
 - 1. Arrows: Either integrally with piping system service lettering to accommodate both directions of flow, or as separate unit on each pipe marker to indicate direction of flow.
- J. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils (0.08 mm) thick.
 - 1. Width: 1-1/2 inches (40 mm) on pipes with OD, including insulation, less than 6 inches (150 mm); 2-1/2 inches (65 mm) for larger pipes.
 - 2. Color: Comply with ASME A13.1, unless otherwise indicated.
- K. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) sequenced numbers. Include 5/32-inch (4-mm) hole for fastener.
 - 1. Material: 0.032-inch- (0.8-mm-) thick, polished brass or aluminum.
 - 2. Material: 0.0375-inch- (1-mm-) thick stainless steel.
 - 3. Material: 3/32-inch- (2.4-mm-) thick plastic laminate with 2 black surfaces and a white inner layer.
 - 4. Material: Valve manufacturer's standard solid plastic.
 - 5. Size: 1-1/2 inches (40 mm) in diameter, unless otherwise indicated.
 - 6. Shape: As indicated for each piping system.
- L. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.

School Engineering

- M. Engraved Plastic-Laminate Signs: ASTM D709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
 2. Thickness: 1/16 inch (1.6 mm), for units up to 20 sq. in. (130 sq. cm) or 8 inches (200 mm) in length, and 1/8 inch (3 mm) for larger units.
 3. Fasteners: Self-tapping, stainless-steel screws or contact-type permanent adhesive.
- N. Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:
1. Green: Cooling equipment and components.
 2. Yellow: Heating equipment and components.
 3. Brown: Energy reclamation equipment and components.
 4. Blue: Equipment and components that do not meet criteria above.
 5. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.
 6. Terminology: Match schedules as closely as possible. Include the following:
 - a. Name and plan number.
 - b. Equipment service.
 - c. Design capacity.
 - d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
 7. Size: 2-1/2 by 4 inches (65 by 100 mm) for control devices, dampers, and valves; 4-1/2 by 6 inches (115 by 150 mm) for equipment.
- O. Plasticized Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with mat finish suitable for writing.
1. Size: 3-1/4 by 5-5/8 inches (83 by 143 mm).
 2. Fasteners: Brass grommets and wire.
 3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
- P. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in piped utility identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of piped utility systems and equipment.
1. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.

2.6 GROUT

- A. Description: ASTM C1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

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1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.7 FLOWABLE FILL

- A. Description: Low-strength-concrete, flowable-slurry mix.
1. Cement: ASTM C150, Type I, portland.
 2. Density: 115- to 145-lb/cu. ft. (1840- to 2325-kg/cu. m).
 3. Aggregates: ASTM C33, natural sand, fine and crushed gravel or stone, coarse.
 4. Aggregates: ASTM C33, natural sand, fine.
 5. Admixture: ASTM C618, fly-ash mineral.
 6. Water: Comply with ASTM C94/C94M.
 7. Strength: 100 to 200 psig (690 to 1380 kPa)] at 28 days.

PART 3 - EXECUTION

3.1 PIPED UTILITY DEMOLITION

- A. Refer to Section 024119 "Selective Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.
1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.
 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make operational.
 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 DIELECTRIC FITTING APPLICATIONS

- A. Dry Piping Systems: Connect piping of dissimilar metals with the following:
1. NPS 2 (DN 50) and Smaller: Dielectric unions.
 2. NPS 2-1/2 to NPS 12 (DN 65 to DN 300): Dielectric flanges or dielectric flange kits.

- B. Wet Piping Systems: Connect piping of dissimilar metals with the following:
 - 1. NPS 2 (DN 50) and Smaller: Dielectric couplings, couplings or dielectric nipples, nipples.
 - 2. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Dielectric nipples.
 - 3. NPS 2-1/2 to NPS 8 (DN 65 to DN 200): Dielectric nipples or dielectric flange kits.
 - 4. NPS 10 and NPS 12 (DN 250 and DN 300): Dielectric flange kits.

3.3 PIPING INSTALLATION

- A. Install piping according to the following requirements and utilities Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping to permit valve servicing.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Sleeves are required for core-drilled holes.
- J. Permanent sleeves are not required for holes formed by removable PE sleeves.
- K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches (50 mm) above finished floor level.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - a. Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).
 - b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.

- L. Verify final equipment locations for roughing-in.
- M. Refer to equipment specifications in other Sections for roughing-in requirements.

3.4 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and utilities Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part I "Quality Assurance" Article.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- H. Soldered Joints: Apply ASTM B813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B32.
- I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.
- K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. ABS Piping: Join according to ASTM D2235 and ASTM D2661 appendixes.
 - 3. CPVC Piping: Join according to ASTM D2846/D2846M Appendix.

School Engineering

4. PVC Pressure Piping: Join schedule number ASTM D1785, PVC pipe and PVC socket fittings according to ASTM D2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D2855.
 5. PVC Nonpressure Piping: Join according to ASTM D2855.
 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D3138 Appendix.
- L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D3139.
- M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D3212.
- N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D2657.
1. Plain-End PE Pipe and Fittings: Use butt fusion.
 2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.
- O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.5 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 3. Install dielectric fittings at connections of dissimilar metal pipes.

3.6 EQUIPMENT INSTALLATION

- A. Install equipment level and plumb, unless otherwise indicated.
- B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.
- C. Install equipment to allow right of way to piping systems installed at required slope.

3.7 PAINTING

- A. Painting of piped utility systems, equipment, and components is specified in Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.8 IDENTIFICATION

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
 - 1. Stenciled Markers: According to ASME A13.1.
 - 2. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.
 - 3. Locate pipe markers on exposed piping according to the following:
 - a. Near each valve and control device.
 - b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
 - c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
 - d. At manholes and similar access points that permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.
 - 1. Lettering Size: Minimum 1/4 inch (6.4 mm) high for name of unit if viewing distance is less than 24 inches (610 mm), 1/2 inch (13 mm) high for distances up to 72 inches (1800 mm), and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
 - 2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

3.9 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of base.
 - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 - 7. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Section 033000 "Cast-in-Place Concrete."

School Engineering

3.10 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Section 055000 "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.11 GROUTING

- A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 330500

SECTION 331415 - SITE WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water-distribution piping and related components outside the building for domestic water service, fire-suppression water service, combined domestic water service and fire-suppression water service. Terminate water-service piping with appropriate fitting for extension by Division 22.

B. Related Requirements:

1. Section 312000 "Earth Moving."
2. Section 312500 "Erosion and Sedimentation Controls."
3. Section 321216 "Asphalt Paving."
4. Section 321313 "Concrete Paving."

1.2 DEFINITIONS

- A. CDA: Copper Development Association.
- B. EPDM: Ethylene-propylene-diene terpolymer rubber.
- C. NP: Nylon
- D. PA: Polyamide (nylon) plastic.
- E. PE: Polyethylene plastic.
- F. PP: Polypropylene plastic.
- G. PVC: Polyvinyl Chloride.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
2. For cast-in-place concrete structures. Include frames and covers and drains.
3. Include diagrams for power, signal, and control wiring for alarms.

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1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- B. Field Quality-Control Submittals:
 - 1. Field quality-control reports.
- C. Purging and Disinfecting Reports: As specified in "Cleaning" Article in Part 3.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of product indicated.
- B. Record Drawings: At Project closeout of installed water-service piping according to Division 01 Section Closeout Procedures."

1.6 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of water-service piping specialties and are based on specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered.
- B. Listing and Labeling: Provide electrically operated specialties and devices specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare piping, valves, meters, backflow prevention devices, and fire hydrants according to the following:
 - 1. Ensure that piping, valves, meters, backflow prevention devices, and fire hydrants are dry and internally protected against rust and corrosion.
 - 2. Protect threaded ends and flange faces against damage.
 - 3. Set piping, valves, meters, backflow prevention devices, and fire hydrants in best position for handling and to prevent rattling.
- B. During Storage: Use precautions for piping, valves, meters, backflow prevention devices, and fire hydrants according to the following:
 - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

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- C. Handling: Use sling to handle products if size requires handling by crane or lift. Rig products to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.8 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Verify that water-service piping may be installed to comply with original design and referenced standards.
- C. Site Information: Reports on subsurface condition investigations made during design of Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this information.
- D. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service in accordance with requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of water-distribution service without Owner's written permission.

1.9 COORDINATION

- A. Coordinate connection to water main with utility company.
- B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building water distribution piping.
- C. Coordinate piping materials, sizes, entry locations, and pressure requirements with building fire-protection water piping.
- D. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
- B. Comply with standards of authorities having jurisdiction for domestic water-service piping, including materials, installation, testing, and disinfection.
- C. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- D. Piping materials to bear label, stamp, or other markings of specified testing agency.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
- F. Comply with ASTM F645 for selection, design, and installation of thermoplastic water piping.
- G. Comply with FM Approvals' "Approval Guide" and/or UL's "Fire Protection Equipment Directory" for fire-suppression water-service products.
- H. Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.
- I. All piping and appurtenances intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61/NSF 372 or are certified in compliance with NSF 61/NSF 372 by an ANSI-accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PIPING MATERIALS

- A. Comply with requirements in "Piping Applications" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and service sizes.
- B. Potable-water piping and components comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping.

2.3 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tube: ASTM B88, Type K (ASTM B88M, Type A) and ASTM B88, Type L (ASTM B88M, Type B).
- B. Annealed-Temper Copper Tube: ASTM B88, Type K (ASTM B88M, Type A) and ASTM B88, Type L (ASTM B88M, Type B).

- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings.
- E. Copper Tube, Pressure-Seal-Joint Fittings:
 - 1. Source Limitations: Obtain copper tube, pressure-seal-joint fittings from single manufacturer.
 - 2. Standard: UL 213.
 - 3. Fittings: Cast brass, cast bronze, or wrought copper with EPDM O-ring seal in each end. NPS 2-1/2 (DN 65) and larger with stainless steel grip ring and EPDM O-ring seal.
 - 4. Minimum 250 psig (1724 kPa) working-pressure rating at 250 deg F (121 deg C).
- F. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
- G. Cast-Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock-body, ball-and-socket, metal-to-metal seating surfaces; and solder-joint or threaded ends.
- H. Wrought-Copper Unions: ASME B16.22.

2.4 DUCTILE-IRON PIPE AND FITTINGS

- A. Mechanical-Joint, Ductile-Iron Pipe:
 - 1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
 - 2. AWWA C104/A21.4 cement mortar-lined.
- B. Mechanical-Joint, Ductile-Iron Fittings:
 - 1. AWWA C110, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
 - 2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
 - 3. AWWA C104/A21.4 cement mortar-lined.
- C. Push-on-Joint, Ductile-Iron Pipe:
 - 1. AWWA C151/A21.51, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
 - 2. AWWA C104/A21.4 cement mortar-lined.
- D. Push-on-Joint, Ductile-Iron Fittings:
 - 1. AWWA C110, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
 - 2. Gaskets: AWWA C111/A21.11, rubber.
 - 3. AWWA C104/A21.4 cement mortar-lined.
- E. Grooved-End, Ductile-Iron Pipe:

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1. AWWA C151/A21.51, with cut, rounded-grooved ends.
2. AWWA C104/A21.4 cement mortar-lined.

F. Grooved-End, Ductile-Iron Pipe Appurtenances:

1. Source Limitations: Obtain grooved-end, ductile-iron pipe appurtenances from single manufacturer.
2. Grooved-End, Ductile-Iron Fittings:
 - a. ASTM A536, ductile-iron castings with dimensions matching pipe.
 - b. AWWA C104/A21.4 cement mortar-lined.
3. Grooved-End, Ductile-Iron-Piping Mechanical Couplings:
 - a. AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

G. Flanges: ASME 16.1, Class 125, cast iron.

2.5 PE PIPE AND FITTINGS

- A. PE, ASTM Pipe: ASTM D2239, SIDR No. 5.3, 7, or 9; with PE compound number required to give pressure rating not less than 200 psig (1380 kPa).
 1. Insert Fittings for PE Pipe: ASTM D2609, made of PA, PP, or PVC with serrated male insert ends matching inside of pipe. Include bands or crimp rings.
 2. Molded PE Fittings: ASTM D3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.
- B. PE, AWWA Pipe: AWWA C906, DR No. 7.3, 9, or 9.3; with PE compound number required to give pressure rating not less than 200 psig (1380 kPa).
 1. PE, AWWA Fittings: AWWA C906, socket- or butt-fusion type, with DR number matching pipe and PE compound number required to give pressure rating not less than 200 psig (1380 kPa).
- C. PE, Fire-Service Pipe: ASTM F714, AWWA C906, or equivalent for PE water pipe; FM Global approved, with minimum thickness equivalent to FM Global Class 150 and Class 200.
 1. Molded PE Fittings: ASTM D3350, PE resin, socket- or butt-fusion type, and made to match PE pipe dimensions and class.

2.6 PVC PIPE AND FITTINGS

- A. PVC, Schedule 40 Pipe: ASTM D1785.
 1. PVC, Schedule 40 Socket Fittings: ASTM D2466.
- B. PVC, Schedule 80 Pipe: ASTM D1785.

School Engineering

1. PVC, Schedule 80 Socket Fittings: ASTM D2467.
 2. PVC, Schedule 80 Threaded Fittings: ASTM D2464.
- C. PVC Pipe: AWWA C900, UL 1285, Class 150 and Class 200, with bell end with gasket, and with spigot end.
1. Comply with UL 1285 for fire-suppression water service.
 2. PVC Fabricated Fittings: AWWA C900, Class 150 and Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
 3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.

2.7 FIBERGLASS PIPE AND FITTINGS

- A. RTRP Pipe: AWWA C950, Class 150, Class 200 and Class 250, Type I or II, Grade 1, epoxy or Grade 2, polyester, with bell-and-spigot ends for bonded with gasket or seal for gasketed joints. Liner is optional unless otherwise indicated. Include FM Global approval if used for fire-service mains.
- B. Fittings, RTRF, AWWA C950: Similar to pipe in material, pressure class, and joining method.
- C. Fittings: Compatible with pipe size, pressure class, and joining method.

2.8 SPECIAL PIPE FITTINGS

- A. Ductile-Iron Rigid Expansion Joints: Three-piece, ductile-iron assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron, end sections.
1. Source Limitations: Obtain ductile-iron rigid expansion joints from single manufacturer.
 2. Standards: AWWA C110 or AWWA C153/A21.53; AWWA C111/A21.11.
 3. Pressure Rating: 250 psig (1725 kPa) minimum.
- B. Ductile-Iron Flexible Expansion Joints: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends. Include two gasketed ball-joint sections and one or more gasketed sleeve sections.
1. Source Limitations: Obtain ductile-iron flexible expansion joints from single manufacturer.
 2. Standards: AWWA C110 or AWWA C153/A21.53; AWWA C111/A21.11.
 3. Pressure Rating: 250 psig (1725 kPa) minimum.
- C. Ductile-Iron Deflection Fittings: Compound, ductile-iron coupling fitting with sleeve and one or two flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends.
1. Source Limitations: Obtain ductile-iron deflection fittings from single manufacturer.
 2. Standards: AWWA C110 or AWWA C153/A21.53; AWWA C111/A21.11.
 3. Pressure Rating: 250 psig (1725 kPa) minimum.

2.9 PIPING JOINING MATERIALS

- A. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series.
- B. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.
- C. Gaskets for Ferrous Piping and Copper-Alloy Tubing: ASME B16.21, asbestos free.
- D. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.10 PIPING SPECIALTIES

- A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- B. Tubular-Sleeve Pipe Couplings: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.
 - 1. Source Limitations: Obtain tubular-sleeve pipe couplings from single manufacturer.
 - 2. Standard: AWWA C219.
 - 3. Center-Sleeve Material: Ductile iron.
 - 4. Gasket Material: Natural or synthetic rubber.
 - 5. Pressure Rating: 200 psig (1380 kPa) minimum.
 - 6. Metal Component Finish: Corrosion-resistant coating or material.
- C. Split-Sleeve Pipe Couplings: Metal, bolted, split-sleeve-type, reducing or transition coupling with sealing pad and closure plates, O-ring gaskets, and bolt fasteners.
 - 1. Source Limitations: Obtain split-sleeve pipe couplings from single manufacturer.
 - 2. Standard: AWWA C227.
 - 3. Sleeve Material: Manufacturer's standard.
 - 4. Sleeve Dimensions: Of thickness and width required to provide pressure rating.
 - 5. Gasket Material: O-rings made of EPDM rubber unless otherwise indicated.
 - 6. Pressure Rating: 200 psig (1380 kPa) minimum.
 - 7. Metal Component Finish: Corrosion-resistant coating or material.
- D. Flexible Connectors:
 - 1. Nonferrous-Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends brazed to hose.
 - 2. Ferrous-Metal Piping: Stainless steel hose covered with stainless steel wire braid; with ASME B1.20.1, threaded steel pipe nipples or ASME B16.5, steel pipe flanges welded to hose.
- E. Dielectric Fittings: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
 - 1. Dielectric Unions:

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- a. Standard: ASSE 1079.
 - b. Pressure Rating: 250 psig (1725 kPa) minimum at 180 deg F (82 deg C)
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.
2. Dielectric Flanges:
- a. Standard: ASSE 1079.
 - b. Factory-fabricated, bolted, companion-flange assembly.
 - c. Pressure Rating: 150 psig (1035 kPa) minimum at 180 deg F (82 deg C) to 300 psig (2070 kPa).
 - d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
3. Dielectric-Flange Insulating Kits: Nonconducting materials for field assembly of companion flanges.
- a. Pressure Rating: 150 psig (1035 kPa) minimum to 300 psig (2070 kPa).
 - b. Gasket: Neoprene or phenolic.
 - c. Bolt Sleeves: Phenolic or PE.
 - d. Washers: Phenolic with steel backing washers.
4. Dielectric Nipples:
- a. Standard: IAPMO PS 66.
 - b. Electroplated steel nipple complying with ASTM F1545.
 - c. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
 - d. End Connections: Male threaded or grooved.
 - e. Lining: Inert and noncorrosive, PP.

2.11 ENCASEMENT FOR PIPING

- A. Standards: ASTM A674 or AWWA C105/A21.5.
- B. Form: Sheet or tube.
- C. Material: Linear low-density PE film of 0.008-inch (0.20-mm) minimum thickness or high-density, cross-laminated PE film of 0.004-inch (0.10-mm) minimum thickness.
- D. Color: Black or natural.

2.12 GATE VALVES

- A. Gate Valves - AWWA, Cast Iron:
 1. Source Limitations: Obtain gate valves - AWWA, cast iron, from single manufacturer.
 2. Gate Valves - Nonrising Stem, Resilient Seated: Cast- or ductile-iron body and bonnet, with bronze or cast- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
 - a. Standards: AWWA C509 or AWWA C515.
 - b. Minimum Pressure Rating: 200 psig (1380 kPa).

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- c. End Connections: Mechanical joint, flanged, threaded, or push on.
 - d. Interior Coating: Complying with AWWA C550.
 - 3. Gate Valves - OS&Y, Rising Stem, Resilient Seated: Cast- or ductile-iron body and bonnet, with bronze or cast- or ductile-iron gate, resilient seats, and bronze stem.
 - a. Standard: AWWA C509 or AWWA C515.
 - b. Minimum Pressure Rating: 200 psig (1380 kPa).
 - c. End Connections: Mechanical joint, flanged, threaded, or push on.
- B. Gate Valves - UL/FM Global, Cast Iron:
 - 1. Source Limitations: Obtain gate valves - UL/FM Global, cast iron, from single manufacturer.
 - 2. Gate Valves - UL/FM Global, Nonrising Stem, Resilient Seated: Cast- or ductile-iron body and bonnet, with flange for indicator post, bronze seating material, and inside screw.
 - a. Standards: AWWA C509 or AWWA C515, UL listed and FM Global approved.
 - b. Minimum Pressure Rating: 175 psig (1207 kPa).
 - c. End Connections: Mechanical joint or flanged.
 - d. Interior Coating: Complying with AWWA C550.
 - 3. Gate Valves - OS&Y, Rising Stem, Resilient Seated: Cast- or ductile-iron body and bonnet and bronze seating material.
 - a. Standards: AWWA C509 or AWWA C515, UL listed and FM Global approved.
 - b. Minimum Pressure Rating: 175 psig (1207 kPa).
 - c. End Connections: Mechanical joint or flanged.
 - d. Interior Coating: Complying with AWWA C550.
- C. Gate Valves - Bronze:
 - 1. Source Limitations: Obtain gate valves - bronze, from single manufacturer.
 - 2. Gate Valves - OS&Y, Rising Stem: Bronze body and bonnet and bronze stem.
 - a. Standards: UL listed and FM Global approved.
 - b. Minimum Pressure Rating: 175 psig (1207 kPa).
 - c. End Connections: Threaded.
 - 3. Gate Valves - Nonrising Stem: Class 125, bronze with solid wedge.
 - a. Standard: MSS SP-80.
 - b. End Connections: Threaded or solder.
 - c. Handwheel: Malleable iron.

2.13 GATE VALVE ACCESSORIES AND SPECIALTIES

- A. Tapping-Sleeve Assemblies: Sleeve and valve compatible with drilling machine.
 - 1. Source Limitations: Obtain tapping-sleeve assemblies from single manufacturer.

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2. Standard: MSS SP-60.
 3. Tapping Sleeve: Cast- or ductile-iron or stainless steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
 4. Valve: AWWA, cast-iron, nonrising-stem, metal resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.
- B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches (125 mm) in diameter.
1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.
- C. Indicator Posts: UL 789, FM Global approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.14 CHECK VALVES

- A. Check Valves - AWWA: Swing-check type with resilient seat with ends to match piping.
1. Source Limitations: Obtain check valves, AWWA, from single manufacturer.
 2. Standards:
 - a. AWWA C508.
 - b. Interior coating in accordance with AWWA C550.
 3. Pressure Rating: 175 psig (1207 kPa).
- B. Check Valves - UL/FM Global: Swing-check type with pressure rating, rubber-face checks unless otherwise indicated, and ends matching piping.
1. Source Limitations: Obtain check valves - UL/FM Global, from single manufacturer.
 2. Standards: UL listed and FM Global approved.
 3. Pressure Rating: 175 psig (1207 kPa).

2.15 DETECTOR CHECK VALVES

- A. Detector Check Valves:
1. Source Limitations: Obtain detector check valves from single manufacturer.
- B. Description: Include threaded bypass taps in inlet and outlet for bypass meter connection. Set valve to allow minimal water flow through bypass meter when major water flow is required.
1. Standards: UL listed and FM Global approved.
 2. Pressure Rating: 175 psig (1207 kPa).

- C. Water Meter: AWWA C700, disc type, at least one-fourth size of detector check valve. Include meter, bypass piping, gate valves, check valve, and connections to detector check valve.

2.16 BUTTERFLY VALVES

A. Butterfly Valves - AWWA:

1. Source Limitations: Obtain butterfly valves - AWWA, from single manufacturer.
2. Standard: AWWA C504.
3. Body: Cast or ductile iron.
4. Body Type: Wafer or flanged.
5. Seat: Rubber.
6. Pressure Rating: 150 psig (1035 kPa).

B. Butterfly Valves - UL:

1. Source Limitations: Obtain butterfly valves - UL, from single manufacturer.
2. Standards: UL 1091 and FM Global approved.
3. Body: Cast or ductile iron.
4. Body Type: Wafer or flanged.
5. Seat: Metal or resilient material.
6. Pressure Rating: 175 psig (1207 kPa).

2.17 CORPORATION VALVES AND CURB VALVES AND METER VALVES

A. Corporation Valves and Curb Valves and Meter Valves:

1. Source Limitations: Obtain valves from single manufacturer.

B. Corporation Valves: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.

1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
2. Corporation Valve: Bronze body, ground-key plug or ball, with AWWA C800, threaded inlet and outlet matching service piping material.
3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.

C. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

1. Service Boxes for Curb Valves: ASTM A48/A48M, Class 25 cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches (75 mm) in diameter.
 - a. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

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- D. Meter Valves: Comply with AWWA C800 for high-pressure, service-line valves. Include angle or straight-through-pattern bronze body, ground-key plug or ball, wide tee head, with inlet and outlet matching service piping material.

2.18 WATER METERS

- A. Water Meter - Utility Company Furnished:

- 1. Utility Company: Birmingham Water Works Board.

- B. Water Meters - Displacement Type:

- 1. Source Limitations: Obtain water meters - displacement type, from single manufacturer.
 - 2. Standard: AWWA C700.
 - 3. Pressure Rating: 150 psig (1035 kPa) working pressure.
 - 4. Body Design: Nutating disc; totalization meter.
 - 5. Registration: Flow in gal. (L) unless cu. ft. (cu. m) are indicated as required by utility company.
 - 6. Case: Bronze.
 - 7. End Connections: Threaded or flanged.

- C. Water Meters - Turbine Type:

- 1. Source Limitations: Obtain water meters - turbine type, from single manufacturer.
 - 2. Standard: AWWA C701.
 - 3. Pressure Rating: 150 psig (1035 kPa) working pressure.
 - 4. Body Design: Turbine; totalization meter.
 - 5. Registration: Flow in gal. (L) unless cu. ft. (cu. m) are indicated as required by utility company.
 - 6. Case: Bronze.
 - 7. End Connections: Threaded or flanged.

- D. Water Meters - Compound Type:

- 1. Source Limitations: Obtain water meters - compound type, from single manufacturer.
 - 2. Standard: AWWA C702.
 - 3. Pressure Rating: 150 psig (1035 kPa) working pressure.
 - 4. Body Design: With integral mainline and bypass meters; totalization meter.
 - 5. Registration: Flow in gal. (L) unless cu. ft. (cu. m) are indicated as required by utility company.
 - 6. Case: Bronze
 - 7. End connections: Flanged.

- E. Water Meters - Ultrasonic Type:

- 1. Source Limitations: Obtain water meters - ultrasonic type, from single manufacturer.
 - 2. Standard: AWWA C715.
 - 3. Pressure Rating: 150 psig (1035 kPa) working pressure.
 - 4. Body Design: Ultrasonic open flow tube; totalization meter.

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5. Registration: Flow in gal. (L) unless cu. ft. (cu. m) are indicated as required by utility company.
 6. Case: Bronze.
 7. End Connections: Threaded or flanged.
- F. Ultrasonic Type Water Meter, Remote Registration System, Direct-Reading Type: Utility company standard. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.
1. Registration: Flow in gal. (L) unless cu. ft. (cu. m) are indicated as required by utility company.
- G. Ultrasonic Type Water Meter, Remote Registration System, Encoder Type: Utility company standard. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.
1. Standard: AWWA C707.
 2. Registration: Flow in gal. (L) unless cu. ft. (cu. m) are indicated as required by utility company.
 3. Data-Acquisition Units: Comply with utility company requirements for type and quantity.
 4. Visible Display Units: Comply with utility company requirements for type and quantity.
- H. Water Meters - Detector Type:
1. Source Limitations: Obtain water meters - detector type, from single manufacturer.
 2. Standards: AWWA C703, and UL listed or FM Global approved.
 3. Pressure Rating: 175 psig (1207 kPa).
 4. Registration: Flow in gal. (L) unless cu. ft. (cu. m) are indicated as required by utility company.
 5. Bypass Meter: AWWA C700, disc; AWWA C701, turbine; AWWA C702, compound-type, bronze case.
- I. Detector Type Water Meter, Remote Registration System, Direct-Reading Type: Utility company standard. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.
1. Registration: Flow in gal. (L) unless cu. ft. (cu. m) are indicated as required by utility company.
- J. Detector Type Water Meter, Remote Registration System, Encoder Type: Utility company standard. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.
1. Standard: AWWA C707.
 2. Registration: Flow in gal. (L) unless cu. ft. (cu. m) are indicated as required by utility company.
 3. Data-Acquisition Units: Comply with utility company requirements for type and quantity.
 4. Visible Display Units: Comply with utility company requirements for type and quantity.

2.19 WATER METER BOXES

A. Water Meter Boxes:

1. Cast-iron body and cover for disc-type water meter, with lettering "WATER METER" in cover; and with slotted, open-bottom base section of length to fit over service piping.
 - a. Option: Base section may be cast-iron, PVC, clay, precast concrete, or other pipe.
2. Cast-iron body and double cover for disc-type water meter, with lettering "WATER METER" in top cover; and with separate inner cover; air space between covers; and slotted, open-bottom base section of length to fit over service piping.
3. Water Meter Boxes: Polymer-concrete body and cover for disc-type water meter, with lettering "WATER METER" in cover; and with slotted, open-bottom base section of length to fit over service piping. Include vertical and lateral design loadings of 15,000 lb minimum over 10 by 10 inches (6800 kg minimum over 254 by 254 mm) square. (For use in non-paved areas only).

2.20 PRESSURE-REDUCING VALVES

A. Pressure-Reducing Valves - Direct Acting:

1. Source Limitations: Obtain pressure-reducing valves - direct acting, from single manufacturer.
2. Standard: ASSE 1003.
3. Pressure Rating: Initial pressure of 250 psig (1724 kPa).
4. Body: Bronze with chrome-plated finish.
5. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).

B. Pressure-Reducing Valves - Pilot Operated: Pilot-operation, diaphragm-type, single-seated main water control valve with interior epoxy coating. Include small pilot control valve, restrictor device, specialty fittings, and sensor piping.

1. Source Limitations: Obtain pressure-reducing valves - pilot operated, from single manufacturer.
2. Pressure Rating: Initial pressure of 250 psig (1724 kPa) minimum.
3. Main Valve Body: Cast- or ductile-iron, or stainless steel body.
4. Pattern: Angle or Globe-valve design.
5. End Connections: Threaded or [grooved or flanged].

2.21 RELIEF VALVES

A. Air-Release Valves:

1. Source Limitations: Obtain air-release valves from single manufacturer.
2. Standard: AWWA C512.
3. Pressure Rating: 300 psig (2070 kPa).
4. Body Material: Cast iron.

5. Trim Material: Stainless steel, brass, or bronze.
- B. Air/Vacuum Valves: Direct-acting, float-operated, hydromechanical device with large orifice to automatically release accumulated air or to admit air during filling of piping.
1. Source Limitations: Obtain air/vacuum valves from single manufacturer.
 2. Standard: AWWA C512.
 3. Pressure Rating: 300 psig (2070 kPa).
 4. Body Material: Cast iron
 5. Trim Material: Stainless steel, brass, or bronze.
- C. Combination Air Valves: Float-operated, hydromechanical device to automatically release accumulated air or to admit air.
1. Source Limitations: Obtain combination air valves from single manufacturer.
 2. Standard: AWWA C512.
 3. Pressure Rating: 300 psig (2070 kPa).
 4. Body Material: Cast iron.
 5. Trim Material: Stainless steel, brass, or bronze.

2.22 VACUUM BREAKERS

- A. Pressure Vacuum Breaker Assembly:
1. Source Limitations: Obtain pressure vacuum breaker assembly from single manufacturer.
 2. Standard: ASSE 1020.
 3. Operation: Continuous-pressure applications.
 4. Pressure Loss: 5 psig (35 kPa) maximum, through middle one-third of flow range.
 5. Accessories: Ball valves on inlet and outlet.

2.23 BACKFLOW PREVENTERS

- A. Backflow Preventers - Reduced-Pressure Principle:
1. Source Limitations: Obtain backflow preventers - reduced-pressure principle, from single manufacturer.
 2. Standard: ASSE 1013 or AWWA C511.
 3. Operation: Continuous-pressure applications.
 4. Pressure Loss: 12 psig (83 kPa) maximum, through middle one-third of flow range.
 5. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved, steel with interior lining complying with AWWA C550 or that is FDA approved, stainless steel for NPS 2-1/2 (DN 65) and larger.
 6. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
 7. Configuration: Designed for horizontal, straight through; vertical inlet, horizontal center section, and vertical outlet; vertical flow.
 8. Accessories:

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- a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; OS&Y gate type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.
- b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.

B. Backflow Preventers - Double-Check Assembly:

1. Source Limitations: Obtain backflow preventers - double-check assembly, from single manufacturer.
2. Standard: ASSE 1015 or AWWA C510.
3. Operation: Continuous-pressure applications unless otherwise indicated.
4. Pressure Loss: 5 psig (35 kPa) maximum, through middle one-third of flow range.
5. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved, steel with interior lining complying with AWWA C550 or that is FDA approved, stainless steel for NPS 2-1/2 (DN 65) and larger.
6. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
7. Configuration: Designed for horizontal, straight through flow.
8. Accessories: Ball valves with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; OS&Y gate valves with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.

C. Backflow Preventers - Reduced-Pressure-Detector, Fire-Protection Assembly:

1. Source Limitations: Obtain backflow preventers - reduced-pressure-detector, fire-protection assembly, from single manufacturer.
2. Standards: ASSE 1047, and UL listed or FM Global approved.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig (83 kPa) maximum, through middle one-third of flow range.
5. Body: Cast iron with interior lining complying with AWWA C550 or that is FDA approved, Steel with interior lining complying with AWWA C550 or that is FDA approved, Stainless steel.
6. End Connections: Flanged.
7. Configuration: Designed for horizontal, straight through; vertical inlet, horizontal center section, and vertical outlet; vertical flow.
8. Accessories:
 - a. Valves: UL 262, FM Global approved, OS&Y gate type with flanged ends on inlet and outlet.
 - b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.
 - c. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

D. Backflow Preventers - Double-Check, Detector Assembly:

1. Source Limitations: Obtain backflow preventers - double-check, detector-assembly, from single manufacturer.
2. Standards: ASSE 1048, and UL listed or FM Global approved.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 5 psig (35 kPa) maximum, through middle one-third of flow range.

5. Body: Cast iron with interior lining complying with AWWA C550 or that is FDA approved, Steel with interior lining complying with AWWA C550 or that is FDA approved, Stainless steel.
6. End Connections: Flanged.
7. Configuration: Designed for horizontal, straight through; vertical inlet, horizontal center section, and vertical outlet; vertical flow.
8. Accessories:
 - a. Valves: UL 262, FM Global approved, OS&Y gate type with flanged ends on inlet and outlet.
 - b. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

E. Backflow Preventer Test Kits: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

1. Source Limitations: Obtain backflow preventer test kits from single manufacturer.

2.24 CONCRETE VAULTS

A. Concrete Vault - Precast, Reinforced Concrete: Designed for A-16 load designation in accordance with ASTM C857 and made in accordance with ASTM C858.

1. Ladder: ASTM A36/A36M, steel or PE-encased steel steps.
2. Manhole:
 - a. ASTM A48/A48M Class No. 35A minimum tensile strength, gray-iron traffic frame and cover; 24-inch (610-mm) minimum diameter unless otherwise indicated.
 - b. ASTM A536, Grade 60-40-18, ductile-iron traffic frame and cover: 24-inch (610-mm) minimum diameter unless otherwise indicated.
3. Drain: ASME A112.6.3, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

2.25 PROTECTIVE ENCLOSURES

A. Freeze-Protection Enclosures: Insulated enclosure designed to protect aboveground water piping, equipment, or specialties from freezing and damage, with heat source to maintain minimum internal temperature of 40 deg F (4 deg C) when external temperatures reach as low as minus 30 deg F (minus 34 deg C).

1. Source Limitations: Obtain freeze-protection enclosures from single manufacturer.
2. Standard: ASSE 1060.
3. Class I: For equipment or devices other than pressure or atmospheric vacuum breakers.
4. Class I-V: For pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.
5. Housing: Reinforced-aluminum or -fiberglass construction.

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- a. Size: Of dimensions indicated, but not less than those required for access and service of protected unit.
 - b. Drain opening for units with drain connection.
 - c. Access doors with locking devices.
 - d. Insulation inside housing.
 - e. Anchoring devices for attaching housing to concrete base.
6. Electric heating cable or heater with self-limiting temperature control.
- B. Freeze-Retardant Enclosures: Insulated enclosure designed to protect aboveground water piping, equipment, or specialties from weather and damage with minimum external temperatures of 33 deg F (0.5 deg C).
1. Source Limitations: Obtain freeze-retardant enclosures from single manufacturer.
 2. Standard: ASSE 1060.
 3. Class II: For equipment or devices other than pressure or atmospheric vacuum breakers.
 4. Class II-V: For pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.
 5. Housing: Reinforced-aluminum or -fiberglass construction.
 - a. Size: Of dimensions indicated, but not less than those required for access and service of protected unit.
 - b. Drain opening for units with drain connection.
 - c. Access doors with locking devices.
 - d. Anchoring devices for attaching housing to concrete base.
- C. Expanded-Metal Enclosures: Enclosure designed to protect aboveground water piping, equipment, or specialties from damage.
1. Source Limitations: Obtain expanded-metal enclosures from single manufacturer.
 2. Standard: ASTM F1267.
 3. Material: Expanded metal side and top panels, of weight and with reinforcement of same metal at edges as required for rigidity.
 4. Type: I, expanded or II, expanded and flattened.
 5. Class: 2, hot-dip, zinc-coated carbon steel.
 6. Size: Of dimensions indicated, but not less than those required for access and service of protected unit.
 7. Locking device.
 8. Lugs or devices for securing enclosure to base.
- D. Enclosure Bases: 6-inch- (150-mm-) minimum thickness precast concrete, of dimensions required to extend at least 6 inches (150 mm) beyond edges of enclosure housings. Include openings for piping.

2.26 FIRE HYDRANTS

- A. Fire Hydrants - Dry Barrel:
1. Source Limitations: Obtain fire hydrants - dry barrel, from single manufacturer.
 2. Pressure Rating: 250 psig (1725 kPa).

3. Standard: AWWA C502.
4. Freestanding configuration, with one NPS 4-1/2 (DN 115) and two NPS 2-1/2 (DN 65) outlets, 5-1/4-inch (133-mm) main valve, drain valve, and NPS 6 (DN 150) mechanical-joint inlet. Include interior coating in accordance with AWWA C550. Hydrant to have cast-iron body, compression-type valve opening against pressure and closing with pressure.
5. Standards: UL 246, and FM Global approved.
6. Freestanding configuration, with one NPS 4-1/2 (DN 115) and two NPS 2-1/2 (DN 65) outlets, 5-1/4-inch (133-mm) main valve, drain valve, and NPS 6 (DN 150) mechanical-joint inlet. Hydrant to have cast-iron body, compression-type valve opening against pressure and closing with pressure.
 - a. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
 - b. Operating and Cap Nuts: Pentagon, 1-1/2 inches (38 mm) point to flat.
 - c. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.
 - d. Exterior Finish: Red alkyd-gloss enamel paint unless otherwise indicated.

B. Fire Hydrants - Wet Barrel:

1. Source Limitations: Obtain fire hydrants - wet barrel, from single manufacturer.
2. Pressure Rating: 150 psig (1035 kPa) minimum.
3. Standard: AWWA C503.
4. Freestanding configuration, with one NPS 4-1/2 (DN 115) and two NPS 2-1/2 (DN 65) outlets, NPS 6 (DN 150) threaded or flanged inlet, and base section with NPS 6 (DN 150) mechanical-joint inlet. Include interior coating in accordance with AWWA C550.
5. Standards: UL 246, and FM Global approved.
6. Freestanding configuration, with one NPS 4-1/2 (DN 115) and two NPS 2-1/2 (DN 65) outlets, NPS 6 (DN 150) threaded or flanged inlet, and base section with NPS 6 (DN 150) mechanical-joint inlet.
 - a. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
 - b. Operating and Cap Nuts: Pentagon, 1-1/2 inches (38 mm) point to flat.
 - c. Direction of Opening: Open hydrant valves by turning operating nut to left or counterclockwise.
 - d. Exterior Finish: Red alkyd-gloss enamel paint unless otherwise indicated.

2.27 FLUSHING HYDRANTS

A. Flushing Hydrants - Post Type: Nonfreeze and drainable, of length required for shutoff valve installation below frost line.

1. Source Limitations: Obtain flushing hydrants - post type, from single manufacturer.
2. Pressure Rating: 150 psig (1035 kPa) minimum.
3. Outlet: One, with horizontal discharge.
4. Hose Thread: NPS 2-1/2 (DN 65), with NFPA 1963 external hose thread for use by local fire department, and with cast-iron cap with brass chain.
5. Barrel: Cast-iron or steel pipe with breakaway feature.

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6. Valve: Bronze body with bronze-ball or plunger closure, and automatic draining.
7. Security: Locking device for padlock.
8. Exterior Finish: Red alkyd-gloss enamel paint unless otherwise indicated.
9. Inlet: NPS 2 (DN 50) minimum.
10. Operating Wrench: One for each unit.

B. Flushing Hydrants - Ground Type: Nonfreeze and drainable, of length required for shutoff valve installation below frost line.

1. Source Limitations: Obtain flushing hydrants - ground type, from single manufacturer.
2. Pressure Rating: 150 psig (1035 kPa) minimum.
3. Outlet: One, with angle discharge.
4. Hose Thread: NPS 2-1/2 (DN 65), with NFPA 1963 external hose thread for use by local fire department, and with cast-iron cap with brass chain.
5. Barrel: Cast-iron or steel pipe.
6. Valve: Bronze body with bronze-ball or plunger closure, and automatic draining.
7. Inlet: NPS 2 (DN 50) minimum.
8. Hydrant Box: Cast iron with cover, for ground mounting.
9. Operating Wrench: One for each unit.

2.28 SAMPLING STATIONS

A. Sampling Station - Post Type: Nonfreeze and drainable, of length required for shutoff valve installation below frost line.

1. Source Limitations: Obtain sampling stations - post type, from single manufacturer.
2. Pressure Rating: 100 psig (690 kPa) minimum.
3. Sampling Outlet: One unthreaded nozzle with handle.
4. Valve: Bronze body with bronze-ball or plunger closure. Include operating handle.
5. Drain: Tubing with separate manual vacuum pump.
6. Inlet: NPS 3/4 (DN 20) minimum.
7. Housing: Weatherproof material with locking device. Include anchor device.
8. Operating Wrench: One for each unit.

2.29 FIRE DEPARTMENT CONNECTIONS

A. Fire Department Connections:

1. Source Limitations: Obtain fire department connections from single manufacturer.
2. Standard: UL 405.
3. Configuration: Freestanding, with cast-bronze body, thread inlets in accordance with NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch- (460-mm-) high, brass sleeve; and round escutcheon plate.
4. Connections:
 - a. Two NPS 2-1/2 (DN 65) inlets and one NPS 4 (DN 100) outlet.
5. Inlet Alignment: Inline, horizontal for wall mounted, Square for freestanding.

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6. Finish Including Sleeve: Polished bronze.
7. Escutcheon Plate Marking: "AUTO SPKR & STANDPIPE."

2.30 ALARM DEVICES

- A. Alarm Devices: UL 753 and FM Global approved, of types and sizes to mate and match piping and equipment.
- B. Water-Flow Indicators: Vane-type water-flow detector, rated for 250 psig (1725 kPa) working pressure; designed for horizontal or vertical installation; with 2 SPDT circuit switches to provide isolated alarm and auxiliary contacts, 7 A, 125 V ac and 0.25 A, 24 V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal when cover is removed.
- C. Supervisory Switches: SPDT; designed to signal valve in other than fully open position.
- D. Pressure Switches: SPDT; designed to signal increase in pressure.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with excavating, trenching, and backfilling requirements in Section 312000 "Earth Moving."

3.2 PIPING APPLICATIONS

- A. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used unless otherwise indicated.
- B. Do not use flanges or unions for underground piping.
- C. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- D. Underground water-service piping NPS 3/4 to NPS 3 (DN 20 to DN 80) to be any of the following:
 1. Soft copper tube, ASTM B88, Type K (ASTM B88M, Type A) ASTM B88, Type L (ASTM B88M, Type B); wrought-copper, solder-joint fittings; and brazed copper, pressure-seal fittings; and pressure-sealed joints.
 2. PE, ASTM pipe; insert fittings for PE pipe; and clamped, molded PE fittings; and heat-fusion joints.
 3. PVC, Schedule 80 pipe; PVC, Schedule 80 socket fittings; and solvent-cemented joints.
 4. NPS 1 to NPS 3 (DN 25 to DN 80) fiberglass, RTRP, AWWA pipe, Class 250; RTRF, AWWA pipe; and bonded joints.
 5. Fiberglass, RTRP, AWWA pipe Class 250; RTRF; and bonded joints.

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- E. Underground water-service piping NPS 4 to NPS 8 (DN 100 to DN 200) to be any of the following:
1. Soft copper tube, ASTM B88, Type K (ASTM B88M, Type A) ASTM B88, Type L (ASTM B88M, Type B); wrought-copper, solder-joint fittings; and brazed joints.
 2. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed, or mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical, or grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.
 3. PE, AWWA pipe; PE, AWWA fittings; and heat-fusion joints.
 4. PVC, Schedule 80 pipe; PVC, Schedule 80 socket fittings; and solvent-cemented joints.
 5. NPS 4 and NPS 6 (DN 100 and DN 150): NPS 6 (DN 150) PVC, AWWA Class 150 pipe; PVC, AWWA Class 150 fabricated or molded fittings; and gasketed joints.
 6. NPS 8 (DN 200): PVC, AWWA Class 200 pipe; PVC, AWWA Class 200 fabricated push-on-joint, ductile-iron or mechanical-joint, ductile-iron fittings; and gasketed joints.
 7. Fiberglass, RTRP, AWWA pipe Class 250; RTRF, AWWA pipe; and bonded joints.
- F. Water Meter Box Water-Service Piping: NPS 3/4 to NPS 2 (DN 20 to DN 50) to be same as underground water-service piping.
- G. Underground fire-service-main piping NPS 4 to NPS 12 (DN 100 to DN 300) to be any of the following:
1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed or mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical or grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.
 2. PE, Class 200, fire-service pipe; molded PE fittings; and heat-fusion joints.
 3. PVC, AWWA Class 150 pipe listed for fire-protection service; PVC Class 150 fabricated or molded fittings; and gasketed joints.
 4. PVC, AWWA Class 200 pipe listed for fire-protection service; PVC Class 200 fabricated fittings; and gasketed joints.
 5. Fiberglass, AWWA, FM Global approved RTRP, Class 200; RTRF; and gasketed joints.
- H. Underground Combined Water-Service and Fire-Service-Main Piping NPS 6 to NPS 12 (DN 150 to DN 3000 to be any of the following:
1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed or mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical or grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.
 2. PVC, AWWA Class 200 pipe listed for fire-protection service; PVC fabricated or molded fittings of same class as pipe; and gasketed joints.
 3. Fiberglass, AWWA, FM Global approved RTRP, Class 200; RTRF; and gasketed joints.

3.3 VALVE APPLICATIONS

- A. General Application: Use mechanical-joint-end valves for NPS 3 (DN 80) and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FM Global, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 (DN 50) and smaller installation.

- B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Underground Valves, NPS 3 (DN 80) and Larger: AWWA, cast-iron, nonrising-stem, metal, resilient, high-pressure, resilient-seated gate valves with valve box.
 2. Underground Valves, NPS 4 (DN 100) and Larger, for Indicator Posts: UL/FM Global, cast-iron, nonrising-stem gate valves with indicator post.
 3. Use the following for valves in vaults and aboveground:
 - a. Gate Valves, NPS 2 (DN 50) and Smaller: Bronze, nonrising or rising stem.
 - b. Gate Valves, NPS 3 (DN 80) and Larger: AWWA, cast iron, OS&Y rising stem, metal seated or AWWA, cast iron, OS&Y rising stem, resilient seated or UL/FM Global, cast iron, OS&Y rising stem.
 - c. Check Valves:[AWWA C508, UL/FM Global, swing type.
 4. Pressure-Reducing Valves: Use for water-service piping in vaults and aboveground to control water pressure.
 5. Relief Valves: Use for water-service piping in vaults and aboveground.
 - a. Air-Release Valves: To release accumulated air.
 - b. Air/Vacuum Valves: To release or admit large volume of air during filling of piping.
 - c. Combination Air Valves: To release or admit air.
 6. Detector Check Valves: Use for water-service piping in vaults and aboveground to detect unauthorized use of water.

3.4 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Comply with Section 330500 "Common Work Results for Utilities" for piping-system common requirements.
- B. Provide a continuous bare copper or aluminum tracer wire not less than 0.10 inch (2.5 mm) in diameter in sufficient length over each separate run of nonmetallic pipe.

3.5 INSTALLATION OF PIPING

- A. Water-Main Connection:
 1. Arrange with utility company for tap of size and in location indicated in water main.
- B. Make connections larger than NPS 2 (DN 50) with tapping machine according to the following:
 1. Install tapping sleeve and tapping valve in accordance with MSS SP-60.
 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
 4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

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- C. Make connections NPS 2 (DN 50) and smaller with drilling machine according to the following:
1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
 2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
 3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
 4. Install corporation valves into service-saddle assemblies.
 5. Install manifold for multiple taps in water main.
 6. Install curb valve in water-service piping with head pointing up and with service box.
- D. Comply with NFPA 24 for fire-service-main piping materials and installation.
1. Install PE corrosion-protection encasement in accordance with ASTM A674 or AWWA C105/A21.5.
 2. Install copper tube and fittings in accordance with CDA's "Copper Tube Handbook."
- E. Install ductile-iron, water-service piping in accordance with AWWA C600 and AWWA M41.
1. Install PE corrosion-protection encasement in accordance with ASTM A674 or AWWA C105/A21.5.
- F. Install PE pipe in accordance with ASTM D2774 and ASTM F645.
- G. Install PVC, AWWA pipe in accordance with ASTM F645 and AWWA M23.
- H. Install fiberglass AWWA pipe in accordance with AWWA M45.
- I. Bury piping with depth of cover over top at least 30 inches (750 mm), with top at least 12 inches (300 mm) below level of maximum frost penetration, and according to the following:
1. Under Driveways: With at least 36 inches (910 mm) of cover over top.
 2. Under Railroad Tracks: With at least 48 inches (1220 mm) of cover over top.
 3. In Loose Gravelly Soil and Rock: With at least 24 inches (600 mm) of additional cover.
- J. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- K. Extend water-service and fire-suppression water-service piping and connect to water-supply source and building water-piping and fire-suppression piping systems at outside face of building wall in locations and pipe sizes indicated.
1. Terminate water-service and fire-suppression water-service piping at building wall until building water-piping and fire-suppression piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water-piping and fire-suppression piping systems when those systems are installed.
- L. Sleeves are specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping" and Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

- M. Mechanical sleeve seals are specified in Section 220517 "Sleeves and Sleeve Seals for Fire-Suppression Piping" and Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- N. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Fire-Suppression Piping" and Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- O. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.
- P. Comply with Section 211200 "Fire-Suppression Standpipes," Section 211313 "Wet-Pipe Sprinkler Systems," and Section 211316 "Dry-Pipe Sprinkler Systems" for fire-suppression-water piping inside the building.
- Q. Comply with Section 221116 "Domestic Water Piping" for potable-water piping inside the building.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices specified in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" and Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for hangers, supports, and anchor devices specified in Section 210529 "Hangers and Supports for Fire-Suppression Piping and Equipment" and Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- C. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 ft. (6 m) long.
 - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 ft. (6 m) or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 ft. (6 m) or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
 - 5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
 - 6. On PVC and fiberglass piping, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.
- D. Install hangers for copper tubing with maximum spacing and minimum rod diameters to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Install hangers for PVC piping with maximum horizontal spacing and minimum rod diameters to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

- F. Install hangers for fiberglass piping with maximum horizontal spacing and minimum rod diameters to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- G. Support horizontal piping within 12 inches (300 mm) of each fitting and coupling.
- H. Support vertical runs of copper tubing to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- I. Support vertical runs of PVC and fiberglass piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 JOINT CONSTRUCTION

- A. Comply with Section 330500 "Common Work Results for Utilities" for basic piping joint construction.
- B. Make pipe joints according to the following:
 - 1. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools and procedures recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.
 - 2. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
 - 3. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
 - 4. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts in accordance with coupling manufacturer's written instructions.
 - 5. PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners in accordance with fitting manufacturer's written instructions.
 - 6. PVC Piping Gasketed Joints: Use joining materials in accordance with AWWA C900. Construct joints with elastomeric seals and lubricant in accordance with ASTM D2774 or ASTM D3139 and pipe manufacturer's written instructions.
 - 7. Fiberglass Piping Bonded Joints: Use adhesive and procedure recommended by piping manufacturer.
 - 8. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - a. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric nipples.
 - b. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges or flange kits.
 - c. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

3.8 INSTALLATION OF ANCHORAGE

- A. Anchorage: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
 - 1. Concrete thrust blocks.

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2. Locking mechanical joints.
 3. Set-screw mechanical retainer glands.
 4. Bolted flanged joints.
 5. Heat-fused joints.
 6. Pipe clamps and tie rods.
- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: In accordance with AWWA C600.
 2. Gasketed-Joint, PVC Water-Service Piping: In accordance with AWWA M23.
 3. Bonded-Joint Fiberglass, Water-Service Piping: In accordance with AWWA M45.
 4. Fire-Service-Main Piping: In accordance with NFPA 24.
- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.9 INSTALLATION OF VALVES

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.
- C. UL-Listed or FM Global-Approved Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.
- D. UL-Listed or FM Global-Approved Valves Other Than Gate Valves: Comply with NFPA 24.
- E. MSS Valves: Install as component of connected piping system.
- F. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.
- G. Pressure-Reducing Valves: Install in vault or aboveground between shutoff valves. Install full-size valved bypass.
- H. Relief Valves: Comply with AWWA C512. Install aboveground with shutoff valve on inlet.
- I. Comply with requirements for concrete piers in Section 033000 "Cast-in-Place Concrete" for support of valves and piping not direct buried.

3.10 INSTALLATION OF DETECTOR-CHECK VALVES

- A. Install in vault or aboveground.
- B. Install for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.

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- C. Support detector check valves, meters, shutoff valves, and piping on brick or concrete piers. Comply with requirements of concrete piers in Section 033000 "Cast-in-Place Concrete."

3.11 INSTALLATION OF WATER METERS

- A. Install water meters, piping, and specialties in accordance with utility company's written instructions.
- B. Water Meters:
 - 1. Install displacement turbine-type water meters, NPS 2 (DN 50) and smaller, in meter boxes with shutoff valves on water meter inlets. Include valves on water meter outlets and valved bypass around meters unless prohibited by authorities having jurisdiction.
 - 2. Install compound turbine-type water meters, NPS 3 (DN 80) and larger, in meter vaults. Include shutoff valves on water meter inlets and outlets and valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.
 - 3. Install detector-type water meters in meter vault in accordance with AWWA M6. Include shutoff valves on water meter inlets and outlets and full-size valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.
- C. Support water meters and piping NPS 3 (DN 80) and larger on concrete piers. Comply with requirements for concrete piers in Section 033000 "Cast-in-Place Concrete."

3.12 ROUGHING-IN FOR WATER METERS

- A. Rough-in piping and specialties for water meter installation in accordance with utility company's written instructions.

3.13 INSTALLATION OF VACUUM BREAKER ASSEMBLIES

- A. Install pressure vacuum breaker assemblies of type, size, and capacity indicated. Include valves and test cocks. Install in accordance with requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install pressure vacuum breaker assemblies in vault or other space subject to flooding.

3.14 INSTALLATION OF BACKFLOW PREVENTERS

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install in accordance with requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install reduced pressure principle type backflow preventers that have relief drain in vault or in other spaces subject to flooding.
- C. Do not install bypass piping around backflow preventers.

- D. Support NPS 2-1/2 (DN 65) and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.15 INSTALLATION OF WATER METER BOXES

- A. Install water meter boxes in paved areas flush with surface.
- B. Install water meter boxes in grass or earth areas with top 2 inches (50 mm) above surface.

3.16 INSTALLATION OF CONCRETE VAULTS

- A. Install precast concrete vaults in accordance with ASTM C891.
- B. Connect area drain outlet to storm drainage piping or as shown on Drawings. Refer to Section 334200 Stormwater Conveyance.

3.17 INSTALLATION OF PROTECTIVE ENCLOSURES

- A. Install concrete base level and with top approximately 2 inches (50 mm) above grade.
- B. Install protective enclosure over valves and equipment.
- C. Anchor protective enclosure to concrete base.

3.18 INSTALLATION OF FIRE HYDRANTS

- A. Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.
- B. Wet-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage.
- C. AWWA Fire Hydrants: Comply with AWWA M17.
- D. UL/FM Global Fire Hydrants: Comply with NFPA 24.

3.19 INSTALLATION OF FLUSHING HYDRANTS

- A. Install post-type flushing hydrants with valve below frost line and provide for drainage. Support in upright position. Include separate gate valve or curb valve and restrained joints in supply piping.
- B. Install ground-type flushing hydrants with valve below frost line and provide for drainage. Install hydrant box flush with grade. Include separate gate valve or curb valve and restrained joints in supply piping.
- C. Install sampling stations with valve below frost line and provide for drainage. Attach weather-resistant housing and support in upright position. Include separate curb valve in supply piping.

3.20 INSTALLATION OF FIRE DEPARTMENT CONNECTIONS

- A. Install ball drip valves at each check valve for fire department connection to mains.
- B. Install protective pipe bollards for each fire department connection on two sides for wall mounted and on three sides for freestanding. Pipe bollards are specified in Section 055000 "Metal Fabrications."

3.21 INSTALLATION OF ALARM DEVICES

- A. Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.
- B. Supervisory Switches: Supervise valves in open position.
 - 1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.
 - 2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.
- C. Locking and Sealing: Secure unsupervised valves as follows:
 - 1. Valves: Install chain and padlock on open OS&Y gate valve.
 - 2. Post Indicators: Install padlock on wrench on indicator post.
- D. Pressure Switches: Drill and thread hole in exposed barrel of fire hydrant. Install switch.
- E. Water-Flow Indicators: Install in water-service piping in vault. Select indicator with saddle and vane matching pipe size. Drill hole in pipe, insert vane, and bolt saddle to pipe.
- F. Connect alarm devices to building fire-alarm system. Wiring and fire-alarm devices are specified in Section 284621.11 "Addressable Fire-Alarm Systems" and Section 284621.13 "Conventional Fire-Alarm Systems."

3.22 CONNECTIONS

- A. See Section 330500 "Common Work Results for Utilities" for piping connections to valves and equipment.
- B. Connect water-distribution piping to utility water main. Use tapping sleeve and tapping valve.
- C. Connect water-distribution piping to interior domestic water and fire-suppression piping.
- D. Connect waste piping from concrete vault drains to storm-drainage system. See Section 334400 "Storm Utility Drainage Piping" for connection to storm-sewer piping.
- E. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

- F. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.23 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
 - 1. Increase pressure in 50 psig (350 kPa) increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig (0 kPa). Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Prepare reports of testing activities.

3.24 IDENTIFICATION

- A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 312000 "Earth Moving."
- B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel. See Section 330500 "Common Work Results for Utilities" for identifying devices.

3.25 CLEANING

- A. Clean and disinfect water-distribution piping as follows:
 - 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 - 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
 - 3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
 - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
 - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for three hours.

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- c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports of purging and disinfecting activities.

END OF SECTION 331415

SECTION 333000 – SANITARY SEWERAGE UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes sanitary sewerage outside the building.
- B. All sanitary sewerage work shall be in accordance with Jefferson County Environmental Services Standards and Specifications.

END OF SECTION 312500

SECTION 334200 - STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes storm drainage, piping, and appurtenances from 5 feet outside the building to point of disposal, including:

1. Ductile-iron culvert pipe and fittings.
2. Ductile-iron, pressure pipe and fittings.
3. Corrugated-steel pipe and fittings.
4. Corrugated-aluminum pipe and fittings.
5. ABS pipe and fittings.
6. PE pipe and fittings.
7. PVC pipe and fittings.
8. Fiberglass sewer pipe and fittings.
9. Concrete pipe and fittings.
10. Non-pressure transition couplings.
11. Pressure pipe couplings.
12. Expansion joints and deflection fittings.
13. Backwater valves.
14. Cleanouts.
15. Drains.
16. Encasement for piping.
17. Manholes.
18. Polymer-concrete, channel drainage systems.
19. Plastic, channel drainage systems.
20. Catch basins.
21. Stormwater inlets.
22. Stormwater detention structures.
23. Pipe outlets.
24. Dry wells.
25. Stormwater disposal systems.

1.3 DEFINITIONS

- A. FRP: Fiberglass-reinforced plastic.
- B. HDPE: High Density Polyethylene Pipe.

- C. PE: Polyethylene plastic.
- D. PVC: Polyvinyl chloride plastic.
- E. RCP: Reinforced concrete pipe.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Manholes: Include plans, elevations, sections, details, frames, and covers.
 - 2. Catch basins, stormwater inlets, and dry wells. Include plans, elevations, sections, details, frames, covers, and grates.
 - 3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.
- C. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- B. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet (1:500) and vertical scale of not less than 1 inch equals 10 feet (1:50). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.
- C. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes in accordance with manufacturer's written rigging instructions.

Schoel Engineering

- D. Handle catch basins and stormwater inlets in accordance with manufacturer's written rigging instructions.

1.8 FIELD CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.
- C. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service in accordance with requirements indicated:
 - 1. Notify Engineer, Construction Manager, and Owner no fewer than two days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.1 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Source Limitations: Obtain hub-and-spigot, cast-iron soil pipe and fittings from single manufacturer.
- B. Pipe and Fittings:
 - 1. Marked with CISPI collective trademark and NSF certification mark.
 - 2. Class: ASTM A74, Service and Extra Heavy class(es).
- C. Gaskets: ASTM C564, rubber.
- D. Caulking Materials: ASTM B29, pure lead and oakum or hemp fiber.

2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Source Limitations: Obtain hubless cast-iron soil pipe and fittings from single manufacturer.
- B. Pipe and Fittings:
 - 1. Marked with CISPI collective trademark and NSF certification mark.
 - 2. Standard: ASTM A888 or CISPI 301.
- C. CISPI, Hubless-Piping Couplings:
 - 1. Source Limitations: Obtain CISPI, hubless-piping couplings from single manufacturer.
 - 2. Description: Stainless-steel corrugated shield; stainless-steel bands and tightening devices; and rubber sleeve with integral, center pipe stop.

3. Standards:
 - a. ASTM C1277 and CIPSI 310 for couplings.
 - b. ASTM C564 for gaskets.

D. Heavy-Duty, Hubless-Piping Couplings:

1. Source Limitations: Obtain heavy-duty, hubless-piping couplings from single manufacturer.
2. Description: Stainless-steel shield; stainless-steel bands and tightening devices; and rubber sleeve with integral, center pipe stop.
3. Standards:
 - a. ASTM C1277 and ASTM C1540 for couplings.
 - b. ASTM C564 for rubber gaskets.

E. Cast-Iron, Hubless-Piping Couplings:

1. Source Limitations: Obtain cast-iron, hubless-piping couplings from single manufacturer.
2. Description: Two-piece, cast-iron housing; stainless-steel bolts and nuts; and rubber sleeve with integral, center pipe stop.
3. Standards:
 - a. ASTM C1277 for couplings.
 - b. ASTM A48/A48M for cast-iron castings.
 - c. ASTM C564 for gaskets.

2.3 DUCTILE-IRON, CULVERT PIPE AND FITTINGS

- A. Pipe: ASTM A716, for push-on joints.
- B. Standard Fittings: AWWA C110/A21.10, ductile or gray iron, for push-on joints.
- C. Compact Fittings: AWWA C153/A21.53, for push-on joints.
- D. Gaskets: AWWA C111/A21.11, rubber.

2.4 DUCTILE-IRON, PRESSURE PIPE AND FITTINGS

- A. Source Limitations: Obtain ductile-iron, pressure pipe and fittings from single manufacturer.
- B. Ductile-Iron, Push-on-Joint Piping:
 1. Ductile-Iron Pipe: AWWA C151/A21.51, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
 2. Ductile-Iron Fittings: AWWA C110/A21.10, push-on-joint ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
 3. Gaskets: AWWA C111/A21.11, rubber.
- C. Ductile-Iron, Mechanical-Joint Piping:

School Engineering

1. Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Ductile-Iron Fittings: AWWA C110/A21.10, mechanical-joint ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
3. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.5 CORRUGATED-STEEL PIPE AND FITTINGS

- A. Source Limitations: Obtain corrugated-steel pipe and fittings from single manufacturer.
- B. Corrugated-Steel Pipe and Fittings: ASTM A760/A760M, Type I with fittings of similar form and construction as pipe.
 1. Special-Joint Bands: Corrugated steel with O-ring seals.
 2. Standard-Joint Bands: Corrugated steel.
 3. Coating: Aluminum or Zinc.

2.6 CORRUGATED-ALUMINUM PIPE AND FITTINGS

- A. Source Limitations: Obtain corrugated-aluminum pipe and fittings from single manufacturer.
- B. Corrugated-Aluminum Pipe and Fittings: ASTM B745/B745M, Type I with fittings of similar form and construction as pipe.
 1. Special-Joint Bands: Corrugated aluminum with O-ring seals.
 2. Standard-Joint Bands: Corrugated aluminum.

2.7 ABS PIPE AND FITTINGS

- A. Source Limitations: Obtain ABS pipe and fittings from single manufacturer.
- B. NSF Marking: Comply with NSF 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.
- C. Solid-Wall ABS Pipe: ASTM D2661, Schedule 40.
- D. Cellular-Core ABS Pipe: ASTM F628, Schedule 40.
- E. ABS Socket Fittings: ASTM D2661, made to ASTM D3311, drain, waste, and vent patterns.
- F. Gaskets: ASTM F477, elastomeric seals.
- G. Solvent Cement: ASTM D2235.

2.8 CORRUGATED-PE PIPE AND FITTINGS

- A. Source Limitations: Obtain corrugated-PE pipe and fittings from single manufacturer.
- B. Corrugated-PE Drainage Pipe and Fittings NPS 3 to NPS 10 (DN 80 to DN 250): AASHTO M 252, Type S, with smooth waterway for coupling joints.
- C. Corrugated-PE Pipe and Fittings NPS 12 to NPS 60 (DN 300 to DN 1500): AASHTO M 294, Type S, with smooth waterway for coupling joints.
- D. Corrugated-PE Silttight Couplings: PE sleeve with ASTM D1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
- E. Corrugated-PE Soiltight Couplings: AASHTO M 294, corrugated, matching pipe and fittings.

2.9 PVC PIPE AND FITTINGS

- A. Source Limitations: Obtain PVC pipe and fittings from single manufacturer.
- B. NSF Marking: Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.
- C. PVC Cellular-Core Piping:
 - 1. PVC Cellular-Core Pipe and Fittings: ASTM F891, Sewer and Drain Series, PS 50 minimum stiffness, PVC cellular-core pipe with plain ends for solvent-cemented joints.
 - 2. Fittings: ASTM D3034, SDR 35, PVC socket-type fittings.
- D. PVC Corrugated Sewer Piping:
 - 1. Pipe: ASTM F949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
 - 2. Fittings: ASTM F949, PVC molded or fabricated, socket type.
 - 3. Gaskets: ASTM F477, elastomeric seals.
- E. PVC Profile Sewer Piping:
 - 1. Pipe: ASTM F794, PVC profile, gravity sewer pipe with bell-and-spigot ends for gasketed joints.
 - 2. Fittings: ASTM D3034, PVC with bell ends.
 - 3. Gaskets: ASTM F477, elastomeric seals.
- F. PVC Type PSM Sewer Piping:
 - 1. Pipe: ASTM D3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
 - 2. Fittings: ASTM D3034, PVC with bell ends.
 - 3. Gaskets: ASTM F477, elastomeric seals.
- G. PVC Gravity Sewer Piping:

School Engineering

1. Pipe and Fittings: ASTM F679, T-1 wall thickness, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F477, elastomeric seals for gasketed joints.

H. PVC Pressure Piping:

1. Pipe: AWWA C900, Class 150 PVC pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: AWWA C900, Class 150 PVC pipe with bell ends
3. Gaskets: ASTM F477, elastomeric seals.

I. PVC Water-Service Piping:

1. Pipe: ASTM D1785, Schedule 80 PVC, with plain ends for solvent-cemented joints.
2. Fittings: ASTM D2467, Schedule 80 PVC, socket type.

J. Adhesive Primer: ASTM F656.

2.10 CONCRETE PIPE AND FITTINGS

A. Source Limitations: Obtain concrete pipe and fittings from single manufacturer.

B. Nonreinforced-Concrete Sewer Pipe and Fittings: ASTM C14 (ASTM C14M), Class 2, with tongue-and-groove ends and gasketed joints with ASTM C443 (ASTM C443M), rubber gaskets.

C. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C76 (ASTM C76M).

1. Tongue-and-groove ends and gasketed joints with ASTM C443 (ASTM C443M), rubber gaskets. Joints shall be made watertight by use of a Portland cement mortar with a 1:2 cement-sand mixture and a minimum of water.
2. Class III, Wall B or C.
 - a. All reinforced concrete pipe shall be class III unless otherwise noted on the drawings.
3. Class IV, Wall B or C.
4. Class V, Wall B or C.

D. Reinforced-Concrete Arch Pipe: ASTM C 506 (ASTM C 506M), latest revision.

2.11 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Concrete Pipes: ASTM C443 (ASTM C443M), rubber.
2. For Cast-Iron Soil Pipes: ASTM C564, rubber.
3. For Fiberglass Pipes: ASTM F477, elastomeric seal or ASTM D5926, PVC.

4. For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926, PVC.
5. For Dissimilar Pipes: ASTM D5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. Source Limitations: Obtain unshielded, flexible couplings from single manufacturer.
2. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

1. Source Limitations: Obtain shielded, flexible couplings from single manufacturer.
2. Description: ASTM C1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Source Limitations: Obtain ring-type, flexible couplings from single manufacturer.
2. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.12 PRESSURE PIPE COUPLINGS

A. Source Limitations: Obtain pressure pipe couplings from single manufacturer.

B. Description: AWWA C219, tubular-sleeve coupling, with center sleeve, gaskets, end rings, and bolt fasteners.

C. Metal, bolted, sleeve-type, reducing or transition coupling, for joining underground pressure piping. Include 250 psig (1725 kPa) minimum pressure rating and ends sized to fit adjoining pipes.

D. Center-Sleeve Material: Manufacturer's standard.

E. Gasket Material: Natural or synthetic rubber.

F. Metal Component Finish: Corrosion-resistant coating or material.

2.13 EXPANSION JOINTS AND DEFLECTION FITTINGS

A. Ductile-Iron, Flexible Expansion Joints:

1. Source Limitations: Obtain ductile-iron, flexible expansion joints from single manufacturer.
2. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110/A21.10 or AWWA C153/A21.53. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig (1725-kPa) minimum working pressure and for offset and expansion indicated.

B. Ductile-Iron Expansion Joints:

1. Source Limitations: Obtain ductile-iron expansion joints from single manufacturer.
2. Description: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile iron or steel with protective coating; bell-and-spigot end sections complying with AWWA C110/A21.10 or AWWA C153/A21.53.
3. Pressure Rating: 250-psig (1725-kPa) minimum working pressure and for expansion indicated.

C. Ductile-Iron Deflection Fittings:

1. Source Limitations: Obtain ductile-iron deflection fittings from single manufacturer.
2. Description: Compound, ductile-iron coupling fitting with sleeve and one or two flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110/A21.10 or AWWA C153/A21.53. Include AWWA C111/A21.11, ductile-iron glands, rubber gaskets, and steel bolts. Include AWWA C111/A21.11 ductile-iron glands, rubber gaskets, and steel bolts.
3. Pressure Rating: 250 psig (1725 kPa) minimum.

2.14 BACKWATER VALVES

A. Cast-Iron Backwater Valves:

1. Source Limitations: Obtain cast-iron backwater valves from single manufacturer.
2. Description: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.
3. Horizontal type; with swing check valve and hub-and-spigot ends.
4. Combination horizontal and manual gate-valve type; with swing check valve, integral gate valve, and hub-and-spigot ends.
5. Terminal type; with bronze seat, swing check valve, and hub inlet.

B. PVC Backwater Valves:

1. Source Limitations: Obtain PVC backwater valves from single manufacturer.
2. Description: Horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

2.15 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Source Limitations: Obtain cast-iron cleanouts from single manufacturer.
2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside caulk or spigot connection and countersunk, tapered-thread, brass closure plug.
3. Top-Loading Classification(s): Light Duty, Medium Duty, Heavy Duty, and Extra-Heavy Duty.
4. Sewer Pipe Fitting and Riser to Cleanout: ASTM A74, Service class, cast-iron soil pipe and fittings.

B. PVC Cleanouts:

1. Source Limitations: Obtain PVC cleanouts from single manufacturer.
2. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.16 DRAINS

A. Cast-Iron Area Drains:

1. Source Limitations: Obtain cast-iron area drains from single manufacturer.
2. Description: ASME A112.6.3 gray-iron round body with anchor flange and round secured grate. Include bottom outlet with inside caulk or spigot connection, of sizes indicated.
3. Top-Loading Classification(s): Medium Duty and Heavy Duty.

B. Cast-Iron Trench Drains:

1. Source Limitations: Obtain cast-iron trench drains from single manufacturer.
2. Description: ASME A112.6.3, 6-inch- (150-mm-) wide top surface, rectangular body with anchor flange or other anchoring device, and rectangular secured grate. Include units of total length indicated and quantity of bottom outlets with inside caulk or spigot connections, of sizes indicated.
3. Top-Loading Classification(s): Medium Duty, Heavy Duty, and Extra-Heavy Duty.

C. Steel Trench Drains:

1. Source Limitations: Obtain steel trench drains from single manufacturer.
2. Description: Factory fabricated from ASTM A242/A242M, welded steel plate, to form rectangular body with uniform bottom downward slope of 2 percent toward outlet, anchor flange, and grate. Include units of total length indicated, bottom outlet of size indicated, outlet strainer, acid-resistant enamel coating on inside and outside surfaces, and grate with openings of total free area at least two times cross-sectional area of outlet.
3. Plate Thicknesses: 1/8 inch (3.2 mm) and 1/4 inch (6.4 mm).
4. Overall Widths: 7-1/2 inches (190 mm) and 12-1/3 inches (313 mm).

D. Grate Openings: 1/4 inch (6.4 mm) circular, 3/8 inch (9.5 mm) circular, 3/8 inch (9.5 mm) circular or 3/8-by-3-inch (9.5-by-76-mm) slots, 3/8-by-3-inch (9.5-by-76-mm) slots.

2.17 ENCASUREMENT FOR PIPING

A. Standard: ASTM A674 or AWWA C105/A21.5.

B. Material: Linear low-density polyethylene film of 0.008-inch (0.20-mm) or cross-laminated HDPE film of 0.004-inch (0.10-mm) minimum thickness.

C. Form: Sheet or tube.

D. Color: Black or natural.

2.18 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C478 (ASTM C478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 8-inch (203-mm) minimum thickness for floor slab and 5-inch (127-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 5-inch (127-mm) minimum thickness, and lengths to provide depth indicated.
6. Top Section: Concentric-cone type unless eccentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C990 (ASTM C990M), bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C923 (ASTM C923M), cast or fitted into manhole walls, for each pipe connection.
9. Steps: ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 48 (1219) inches (mm).
10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Designed Precast Concrete Manholes:

1. Description: ASTM C913; designed in accordance with ASTM C890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.
3. Joint Sealant: ASTM C990 (ASTM C990M), bitumen or butyl rubber.
4. Resilient Pipe Connectors: ASTM C923 (ASTM C923M), cast or fitted into manhole walls, for each pipe connection.
5. Steps: ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 48 (1219) inches (mm).
6. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.

7. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope.

C. Fiberglass Manholes:

1. Source Limitations: Obtain fiberglass manholes from single manufacturer.
2. Description: ASTM D3753.
3. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.
4. Ballast: Increase thickness of concrete base as required to prevent flotation.
5. Base Section: Concrete, 8-inch (203-mm) minimum thickness.
6. Resilient Pipe Connectors: ASTM C923 (ASTM C923M), cast or fitted into manhole walls, for each pipe connection.
7. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 48 (1219) inches (mm).
8. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
9. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

D. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (102-mm-) minimum width flange and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A48/A48M, Class 35 gray iron unless otherwise indicated.

2.19 CONCRETE

A. General: Cast-in-place concrete in accordance with ACI 318 (ACI 318M), ACI 350 (ACI 350M), and the following:

1. Cement: ASTM C150/C150M, Type II.
2. Fine Aggregate: ASTM C33/C33M, sand.
3. Coarse Aggregate: ASTM C33/C33M, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A615/A615M, Grade 60 (420 MPa) deformed steel.

- C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
 - 1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - a. Invert Slope: 1 percent through manhole.
 - 2. Benches: Concrete, sloped to drain into channel.
 - a. Slope: 4 percent.
- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.
 - 1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
 - 2. Reinforcing Bars: ASTM A615/A615M, Grade 60 (420 MPa) deformed steel.

2.20 POLYMER-CONCRETE, CHANNEL DRAINAGE SYSTEMS

- A. Narrow, Sloped-Invert, Polymer-Concrete Channel Drainage Systems:
 - 1. Source Limitations: Obtain narrow, sloped-invert channel drainage systems from single manufacturer.
 - 2. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
 - 3. Channel Sections: Narrow, interlocking-joint, sloped-invert, polymer-concrete modular units with end caps.
 - a. Include rounded bottom, with built-in invert slope of 0.6 percent and with outlets in number, sizes, and locations indicated.
 - b. Include extension sections necessary for required depth.
 - c. Dimensions: 4-inch (102-mm) inside width. Include number of units required to form total lengths indicated.
 - d. Frame: Gray-iron or galvanized steel for grates.
 - 4. Grates: Manufacturer's designation "heavy duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.
 - a. Material: Gray iron.
 - 1) Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.
 - 5. Covers: Solid ductile or gray iron, of width and thickness that fit recesses in channel sections, and of lengths indicated.
 - 6. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.

Schoel Engineering

7. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

B. Narrow, Level-Invert, Polymer-Concrete Channel Drainage Systems:

1. Source Limitations: Obtain narrow, level-invert channel drainage systems from single manufacturer.
2. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
3. Channel Sections: Narrow, interlocking-joint, precast, polymer-concrete modular units with end caps.
 - a. Include rounded bottom, with level invert and with NPS 4 (DN 100) outlets in number and locations indicated.
 - b. Dimensions: 5- (127-) inch (mm) inside width and 9-3/4 (248) inches (mm) deep. Include number of units required to form total lengths indicated.
 - 1) Frame: Gray-iron or galvanized steel for grates.
4. Grates: Manufacturer's designation "heavy duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.
 - a. Material: Gray iron.
 - b. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.
5. Covers: Solid ductile or gray iron, of width and thickness that fit recesses in channel sections, and of lengths indicated.
6. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
7. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

C. Wide, Level-Invert, Polymer-Concrete Channel Drainage Systems:

1. Source Limitations: Obtain wide, level-invert channel drainage systems from single manufacturer.
2. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
3. Channel Sections: Wide, interlocking-joint, precast, polymer-concrete modular units with end caps.
 - a. Include flat or rounded bottom, with level invert and with outlets in number, sizes, and locations indicated.
 - b. Dimensions: 8- (203-) inch (mm) inside width and 13-3/4 (350) inches (mm) deep. Include number of units required to form total lengths indicated.
 - 1) Frame: Gray iron or galvanized steel for grates.
4. Grates: Manufacturer's designation "heavy duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.

School Engineering

- a. Material: Gray iron.
 - b. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.
5. Covers: Solid ductile or gray iron, of width and thickness that fit recesses in channel sections, and of lengths indicated.
 6. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
 7. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.
- D. Drainage Specialties: Precast, polymer-concrete units.
1. Large Catch Basins:
 - a. 24-by-12-inch (610-by-305-mm) polymer-concrete body, with outlets in quantities and sizes indicated.
 - b. Gray-iron slotted grate.
 - c. Frame: Include gray-iron or steel frame for grate.
 2. Small Catch Basins:
 - a. 19- to 24-inch by approximately 6-inch (483- to 610-mm by approximately 150-mm) polymer-concrete body, with outlets in quantities and sizes indicated.
 - b. Gray-iron slotted grate.
 - c. Frame: Include gray-iron or steel frame for grate.
 3. Oil Interceptors:
 - a. Polymer-concrete body with interior baffle and four steel support channels and two 1/4-inch- (6.4-mm-) thick, steel-plate covers.
 - b. Capacity: 140 gal. (530 L), 200 gal. (757 L), or 260 gal. (984 L) as specified.
 - c. Inlet and Outlet: NPS 4 (DN 100) or NPS 6 (DN 150) as specified.
 4. Sediment Interceptors:
 - a. 27-inch- (686-mm-) square, polymer-concrete body, with outlets in quantities and sizes indicated.
 - b. 24-inch- (610-mm-) square, gray-iron frame and slotted grate.

2.21 PLASTIC, CHANNEL DRAINAGE SYSTEMS

- A. General Requirements for Plastic, Channel Drainage Systems:
1. Modular system of plastic channel sections, grates, and appurtenances.
 2. Designed so grates fit into frames without rocking or rattling.
 3. Number of units required to form total lengths indicated.
 4. Not suitable for vehicular areas.
- B. FRP Channel Drainage Systems:

School Engineering

1. Source Limitations: Obtain FRP channel drainage systems from single manufacturer.
2. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
3. Channel Sections: Interlocking-joint, sloped-invert, FRP modular units, with end caps. Include flat, rounded, or inclined inside bottom, with outlets in number, sizes, and locations indicated.
 - a. Dimensions: 4 inches (102 mm), 6 inches (152 mm), or 8 inches (203 mm) wide. Include number of units required to form total lengths indicated.
 - b. Frame: Galvanized steel or Stainless steel for grates.
4. Grates: With slots or perforations and widths and thickness that fit recesses in channel sections.
 - a. Material: Gray iron.
 - b. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.
5. Covers: Solid ductile or gray iron, of width and thickness that fit recesses in channel sections, and of lengths indicated.
6. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
7. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

C. HDPE or PE Channel Drainage Systems:

1. Source Limitations: Obtain HDPE or PE channel drainage systems from single manufacturer.
2. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
3. Channel Sections: Interlocking-joint, HDPE or PE modular units, with end caps. Include flat, rounded, or inclined bottom, with level invert and with outlets in number, sizes, and locations indicated.
 - a. Dimensions: 4 inches (102 mm) wide. Include number of units required to form total lengths indicated.
4. Grates: With slots or perforations and widths and thickness that fit recesses in channel sections.
 - a. Material: Gray iron.
5. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
6. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.22 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C478 (ASTM C478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 8-inch (203-mm) minimum thickness for floor slab and 6-inch (152-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 5-inch (127-mm) minimum thickness, 48-inch (1200-mm) diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C990 (ASTM C990M), bitumen or butyl rubber.
6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 225-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
8. Steps: ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 48 (1219) inches (mm).
9. Pipe Connectors: ASTM C923 (ASTM C923M), resilient, of size required, for each pipe connecting to base section.

B. Designed Precast Concrete Catch Basins: ASTM C913, precast, reinforced concrete; designed in accordance with ASTM C890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for joint sealants.

1. Joint Sealants: ASTM C990 (ASTM C990M), bitumen or butyl rubber.
2. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 225-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
4. Steps: ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 48 (1219) inches (mm).
5. Pipe Connectors: ASTM C923 (ASTM C923M), resilient, of size required, for each pipe connecting to base section.

C. Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for A-16 (AASHTO HS20-44), structural loading. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 by 24 inches (610 by 610 mm) minimum unless otherwise indicated.
2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

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- D. Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for A-16 (AASHTO HS20-44), structural loading. Include 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (102-mm-) minimum width flange, and 26-inch- (660-mm-) diameter flat grate with small square or short-slotted drainage openings.

- 1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.23 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening, of materials and dimensions indicated.
- B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions indicated. Include heavy-duty frames and grates.
- C. Yard Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions indicated. Include heavy-duty frames and grates.
- D. Frames and Grates: Heavy duty, Dimensions, opening pattern, free area, and other attributes indicated.
 - 1. Material: ASTM A 48, Class 30 (ASTM A 48M, Class No. 200A) minimum, gray-iron casting.
 - 2. Grate Free Area: Approximately 50 percent, unless otherwise indicated. in accordance with utility standards.

2.24 STORMWATER DETENTION STRUCTURES

- A. Cast-in-Place Concrete, Stormwater Detention Structures: Constructed of reinforced-concrete bottom, walls, and top; designed in accordance with ASTM C890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
 - 1. Ballast: Increase thickness of concrete as required to prevent flotation.
 - 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 229-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and cover.
 - 3. Steps: ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of structure to finished grade is less than 48 (1219) inches (mm).
- B. Manhole Frames and Covers: ASTM A536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (102-mm-) minimum width flange, and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

2.25 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.

- B. Riprap Basins: Broken, irregularly sized and shaped, graded stone in accordance with NSSGA's "Quarried Stone for Erosion and Sediment Control."
 - 1. Average Size: NSSGA No. R-3, screen opening 2 inches (51 mm).
 - 2. Average Size: NSSGA No. R-4, screen opening 3 inches (76 mm).
 - 3. Average Size: NSSGA No. R-5, screen opening 5 inches (127 mm).
- C. Filter Stone: In accordance with NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.
- D. Energy Dissipaters: In accordance with NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton (2721-kg) average weight armor stone, unless otherwise indicated.

2.26 DRY WELLS

- A. Description: ASTM C913, precast, reinforced, perforated concrete rings. Include the following:
 - 1. Floor: Cast-in-place concrete.
 - 2. Cover: Liftoff-type concrete cover with cast-in lift rings.
 - 3. Wall Thickness: 4 inches (102 mm) minimum with 1-inch (25-mm) diameter or 1-by-3-inch- (25-by-76-mm-) maximum slotted perforations arranged in rows parallel to axis of ring.
 - a. Total Free Area of Perforations: Approximately 15 percent of ring interior surface.
 - b. Ring Construction: Designed to be self-aligning.
 - 4. Filtering Material: ASTM D448, Size No. 24, 3/4- to 2-1/2-inch (19- to 63-mm) washed, crushed stone or gravel.
- B. Manufactured PE Dry Wells:
 - 1. Description: Manufactured PE side panels and top cover that assemble into 50-gal. (190-L) storage capacity units.
 - 2. Source Limitations: Obtain manufactured PE dry wells from single manufacturer.
 - 3. Side Panels: With knockout ports for piping and seepage holes.
 - 4. Top Cover: With knockout port for drain.
 - 5. Filter Fabric: As recommended by unit manufacturer.
 - 6. Filtering Material: ASTM D448, Size No. 24, 3/4- to 2-1/2-inch (19- to 63-mm) washed, crushed stone or gravel.
- C. Description: Constructed-in-place aggregate type. Include the following:
 - 1. Lining: Concrete blocks or precast concrete rings with notches or weep holes.
 - 2. Filtering Material: ASTM D448, Size No. 24, 3/4- to 2-1/2-inch (19- to 63-mm) washed, crushed stone or gravel.
 - 3. Cover: Precast, reinforced-concrete slab, designed for structural loading in accordance with ASTM C890 and made in accordance with ASTM C913. Include slab dimensions that will extend 12 inches (300 mm) minimum beyond edge of excavation, with bituminous coating over entire surface. Cast cover with opening for manhole in center.

4. Manhole: 24-inch- (610-mm-) diameter, reinforced-concrete access lid with steel lift rings. Include bituminous coating over entire surface.

2.27 STORMWATER DISPOSAL SYSTEMS

A. Chamber Systems:

1. Source Limitations: Obtain chamber systems from single manufacturer.
2. Storage and Leaching Chambers: Molded PE with perforated sides and open bottom. Include number of chambers, distribution piping, end plates, and other standard components as required for system total capacity.
3. Filtering Material: ASTM D448, Size No. 24, 3/4- to 2-1/2-inch (19- to 63-mm) washed, crushed stone or gravel.
4. Filter Mat: Geotextile woven or spun filter fabric, in one or more layers, for minimum total unit weight of 4 oz./sq. yd. (135 g/sq. m).

B. Pipe Systems: Perforated manifold, header, and lateral piping complying with AASHTO M 252 for NPS 10 (DN 250) and smaller, AASHTO M 294 for NPS 12 to NPS 60 (DN 300 to DN 1500). Include proprietary fittings, couplings, seals, and filter fabric.

1. Source Limitations: Obtain pipe systems from single manufacturer.

PART 3 - EXECUTION

3.1 EARTHWORK

- #### A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- #### A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- #### B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- #### C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- #### D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- #### E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

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- F. Install gravity-flow, nonpressure drainage piping in accordance with the following:
1. Install piping pitched down in direction of flow.
 2. Install piping NPS 6 (DN 150) and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
 3. Install piping with 36- (915-) inch- (mm-) minimum cover.
 4. Install hub-and-spigot, cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 5. Install hubless cast-iron soil piping in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 6. Install ductile-iron piping and special fittings in accordance with AWWA C600 or AWWA M41.
 7. Install corrugated-steel piping in accordance with ASTM A798/A798M.
 8. Install corrugated-aluminum piping in accordance with ASTM B788/B788M.
 9. Install ABS sewer piping in accordance with ASTM D2321 and ASTM F1668.
 10. Install PE corrugated sewer piping in accordance with ASTM D2321.
 11. Install PVC cellular-core piping in accordance with ASTM D2321 and ASTM F1668.
 12. Install PVC sewer piping in accordance with ASTM D2321 and ASTM F1668.
 13. Install PVC profile gravity sewer piping in accordance with ASTM D2321 and ASTM F1668.
 14. Install PVC water-service piping in accordance with ASTM D2321 and ASTM F1668.
 15. Install fiberglass sewer piping in accordance with ASTM D3839 and ASTM F1668.
 16. Install nonreinforced-concrete sewer piping in accordance with ASTM C1479 and ACPA's "Concrete Pipe Installation Manual."
 17. Install reinforced-concrete sewer piping in accordance with ASTM C1479 and ACPA's "Concrete Pipe Installation Manual."
- G. Install force-main pressure piping in accordance with the following:
1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
 2. Install piping with 36- (915-) inch- (mm-) minimum cover.
 3. Install ductile-iron pressure piping in accordance with AWWA C600 or AWWA M41.
 4. Install ductile-iron special fittings in accordance with AWWA C600.
 5. Install PVC pressure piping in accordance with AWWA M23, or ASTM D2774 and ASTM F1668.
 6. Install PVC water-service piping in accordance with ASTM D2774 and ASTM F1668.
- H. Install corrosion-protection piping encasement over the following underground metal piping in accordance with ASTM A674 or AWWA C105/A21.5:
1. Hub-and-spigot, cast-iron soil pipe and fittings.
 2. Hubless cast-iron soil pipe and fittings.
 3. Ductile-iron pipe and fittings.
 4. Expansion joints and deflection fittings.

3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping in accordance with the following:
1. Join hub-and-spigot, cast-iron soil piping with gasketed joints in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
 2. Join hub-and-spigot, cast-iron soil piping with caulked joints in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum caulked joints.
 3. Join hubless cast-iron soil piping in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
 4. Join ductile-iron culvert piping in accordance with AWWA C600 for push-on joints.
 5. Join ductile-iron piping and special fittings in accordance with AWWA C600 or AWWA M41.
 6. Join corrugated-steel sewer piping in accordance with ASTM A798/A798M.
 7. Join corrugated-aluminum sewer piping in accordance with ASTM B788/B788M.
 8. Join ABS sewer piping in accordance with ASTM D2321 for elastomeric-seal joints.
 9. Join corrugated-PE piping in accordance with ASTM D3212 for push-on joints.
 10. Join PVC cellular-core piping in accordance with ASTM D2321 and ASTM F891 for solvent-cemented joints.
 11. Join PVC corrugated sewer piping in accordance with ASTM D2321 for elastomeric-seal joints.
 12. Join PVC sewer piping in accordance with ASTM D2321 and ASTM D3034 for elastomeric-seal joints or ASTM D3034 for elastomeric-gasketed joints.
 13. Join PVC profile gravity sewer piping in accordance with ASTM D2321 for elastomeric-seal joints or ASTM F794 for gasketed joints.
 14. Join fiberglass sewer piping in accordance with ASTM D3839 for elastomeric-seal joints.
 15. Join nonreinforced-concrete sewer piping in accordance with ASTM C14 (ASTM C14M) and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
 16. Join reinforced-concrete sewer piping in accordance with ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
 17. Join dissimilar pipe materials with nonpressure-type flexible couplings.
- B. Join force-main pressure piping in accordance with the following:
1. Join ductile-iron pressure piping in accordance with AWWA C600 or AWWA M41 for push-on joints.
 2. Join ductile-iron special fittings in accordance with AWWA C600 or AWWA M41 for push-on joints.
 3. Join PVC pressure piping in accordance with AWWA M23 for gasketed joints.
 4. Join PVC water-service piping in accordance with ASTM D2855 for solvent-cemented joints.
 5. Join dissimilar pipe materials with pressure-type couplings.

3.4 BACKWATER VALVE INSTALLATION

- A. Install horizontal-type backwater valves in piping where indicated.
- B. Install combination horizontal and manual gate-valve type in piping and in manholes where indicated.

- C. Install terminal-type backwater valves on end of piping and in manholes where indicated.

3.5 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 - 1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
 - 2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
 - 3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
 - 4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads and truck service yards.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 (450 by 450 by 300) inches (mm) deep. Set with tops 1 (25) inch (mm) above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.6 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
 - 1. Use Light-Duty, top-loading classification drains in earth or unpaved foot-traffic areas.
 - 2. Use Medium-Duty, top-loading classification drains in paved foot-traffic areas.
 - 3. Use Heavy-Duty, top-loading classification drains in vehicle-traffic service areas.
 - 4. Use Extra-Heavy-Duty, top-loading classification drains in roads and truck service yards.
- B. Embed drains in 4-inch- (102-mm-) minimum concrete around bottom and sides.
- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.
- E. Assemble trench sections with flanged joints.
- F. Embed trench sections in 4- (102-) inch- (mm-) minimum concrete around bottom and sides.

3.7 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants in accordance with ASTM C891.
- C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

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- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 6 inches (152 mm) above finished surface elsewhere unless otherwise indicated.

3.8 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

3.9 STORMWATER INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipaters at outlets, as indicated.

3.10 DRY WELL INSTALLATION

- A. Excavate hole to diameter of at least 6 inches (150 mm) greater than outside of dry well. Do not extend excavation into ground-water table.
- B. Install precast, concrete-ring dry wells in accordance with the following:
 - 1. Assemble rings to depth indicated.
 - 2. Extend rings to height where top of cover will be approximately 8 inches (203 mm) below finished grade.
 - 3. Backfill bottom of inside of rings with filtering material to level at least 12 inches (300 mm) above bottom.
 - 4. Extend effluent inlet pipe 12 inches (300 mm) into rings and terminate into side of tee fitting.
 - 5. Backfill around outside of rings with filtering material to top level of rings.
 - 6. Install cover over top of rings.
- C. Install manufactured, PE dry wells in accordance with manufacturer's written instructions and the following:
 - 1. Assemble and install panels and cover.
 - 2. Backfill bottom of inside of unit with filtering material to level at least 12 (300) inches (mm) above bottom.
 - 3. Extend effluent inlet pipe 12 (300) inches (mm) into unit and terminate into side of tee fitting.
 - 4. Install filter fabric around outside of unit.
 - 5. Install filtering material around outside of unit.

- D. Install constructed-in-place dry wells in accordance with the following:
1. Install brick lining material dry and laid flat, with staggered joints for seepage. Build to diameter and depth indicated.
 2. Install block lining material dry, with staggered joints and 20 percent minimum of blocks on side for seepage. Install precast concrete rings with notches or weep holes for seepage. Build to diameter and depth indicated.
 3. Extend lining material to height where top of manhole will be approximately 8 (203) inches (mm) below finished grade.
 4. Backfill bottom of inside of lining with filtering material to level at least 12 (300) inches (mm) above bottom.
 5. Extend effluent inlet pipe 12 (300) inches (mm) into lining and terminate into side of tee fitting.
 6. Backfill around outside of lining with filtering material to top level of lining.
 7. Install manhole over top of dry well. Support cover on undisturbed soil. Do not support cover on lining.

3.11 CONCRETE PLACEMENT

- A. Place cast-in-place concrete in accordance with ACI 318 (ACI 318M).

3.12 CHANNEL DRAINAGE SYSTEM INSTALLATION

- A. Install with top surfaces of components, except piping, flush with finished surface.
- B. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
- C. Embed channel sections and drainage specialties in 4- (102-) inch- (mm-) minimum concrete around bottom and sides.
- D. Fasten grates to channel sections if indicated.
- E. Assemble channel sections with flanged or interlocking joints.
- F. Embed channel sections in 4- (102-) inch- (mm-) minimum concrete around bottom and sides.

3.13 STORMWATER DISPOSAL SYSTEM INSTALLATION

- A. Chamber Systems: Excavate trenches of width and depth, and install system and backfill in accordance with chamber manufacturer's written instructions. Include storage and leaching chambers, filtering material, and filter mat.
- B. Piping Systems: Excavate trenches of width and depth, and install piping system, filter fabric, and backfill, in accordance with piping manufacturer's written instructions.

3.14 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."
- B. Connect force-main piping to building's storm drainage force mains specified in Section 221413 "Facility Storm Drainage Piping." Terminate piping where indicated.
- C. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
 - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
 - 3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.
 - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.
 - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
 - 4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- D. Connect to sediment interceptors specified in Section 221323 "Sanitary Waste Interceptors."
- E. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
 - 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
 - a. Unshielded or Shielded flexible couplings for same or minor difference OD pipes.
 - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
 - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
 - 2. Use pressure-type pipe couplings for force-main joints.

3.15 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 - 1. Close open ends of piping with at least 8- (203-) inch- (mm-) thick, brick masonry bulkheads.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
 - 1. Remove manhole or structure and close open ends of remaining piping.
- C. Backfill to grade in accordance with Section 312000 "Earth Moving."

3.16 IDENTIFICATION

- A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
 - 1. Use warning tape or detectable warning tape over ferrous piping.
 - 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.17 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

School Engineering

1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems in accordance with requirements of authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 4. Submit separate report for each test.
 5. Gravity-Flow Storm Drainage Piping: Test in accordance with requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
 - b. Option: Test plastic piping in accordance with ASTM F1417.
 6. Force-Main Storm Drainage Piping: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 (1035) psig (kPa).
 - a. Ductile-Iron Piping: Test in accordance with AWWA C600, "Hydraulic Testing" Section.
 - b. PVC Piping: Test in accordance with AWWA M23, "Testing and Maintenance" Chapter.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.18 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION 334200

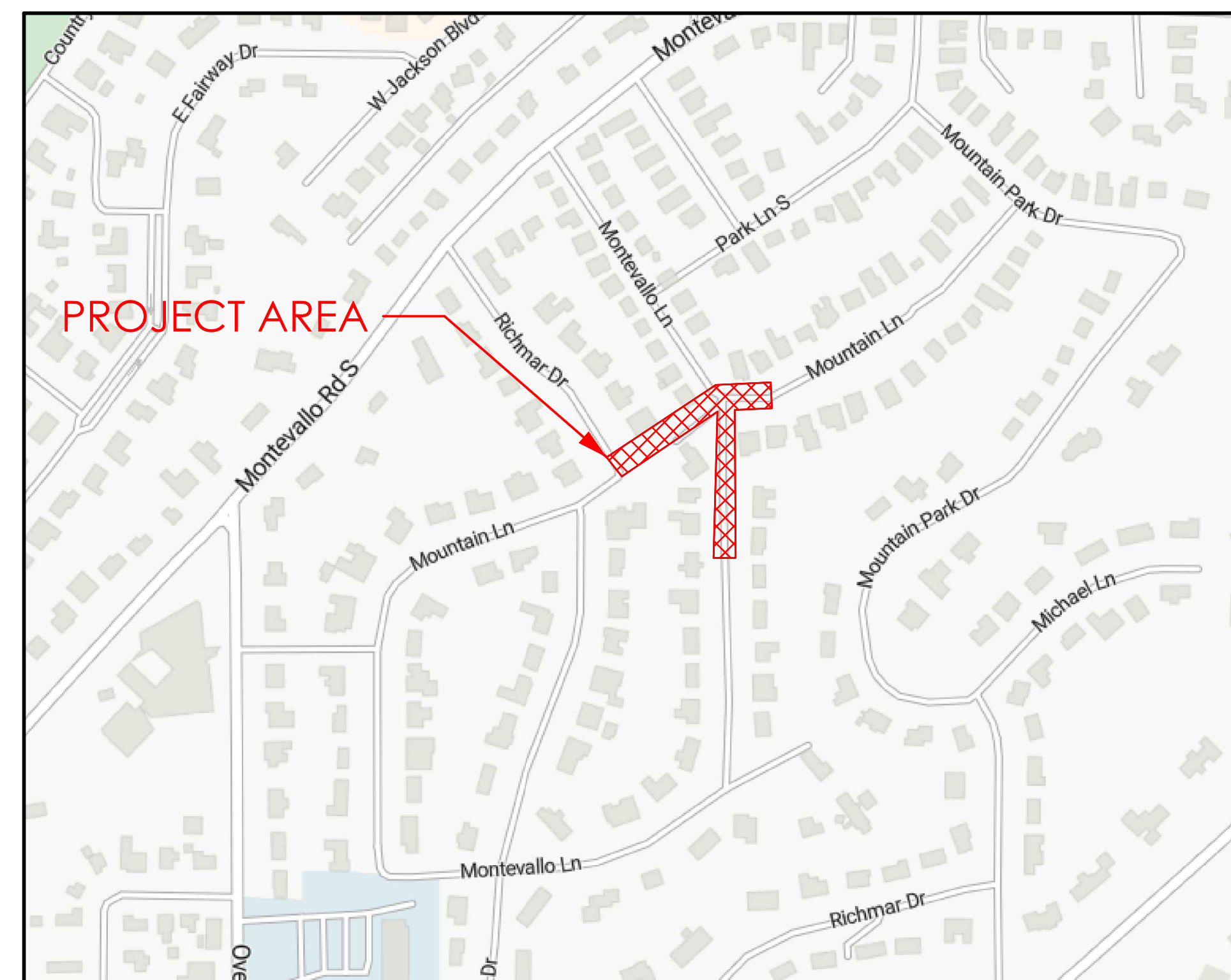
EXHIBIT F – Drawings and Plans

See attached.

MOUNTAIN LN AND MONTEVALLO LN AREA DRAINAGE IMPROVEMENTS MOUNTAIN BROOK, ALABAMA

DRAWING INDEX

- 1 GENERAL NOTES
- 2 TOPOGRAPHIC SURVEY
- 3 DEMOLITION PLAN
- 4 LAYOUT PLAN
- 5 GRADING & DRAINAGE PLAN
- 6 STORM PROFILES
- 7 WALL PROFILES
- 8 SANITARY PLAN AND PROFILE
- 9 EROSION CONTROL PLAN
- 10 LANDSCAPE GRADING PLAN
- 11 LANDSCAPE PLAN
- 12 LANDSCAPE DETAILS
- 13-16 DETAILS



VICINITY MAP

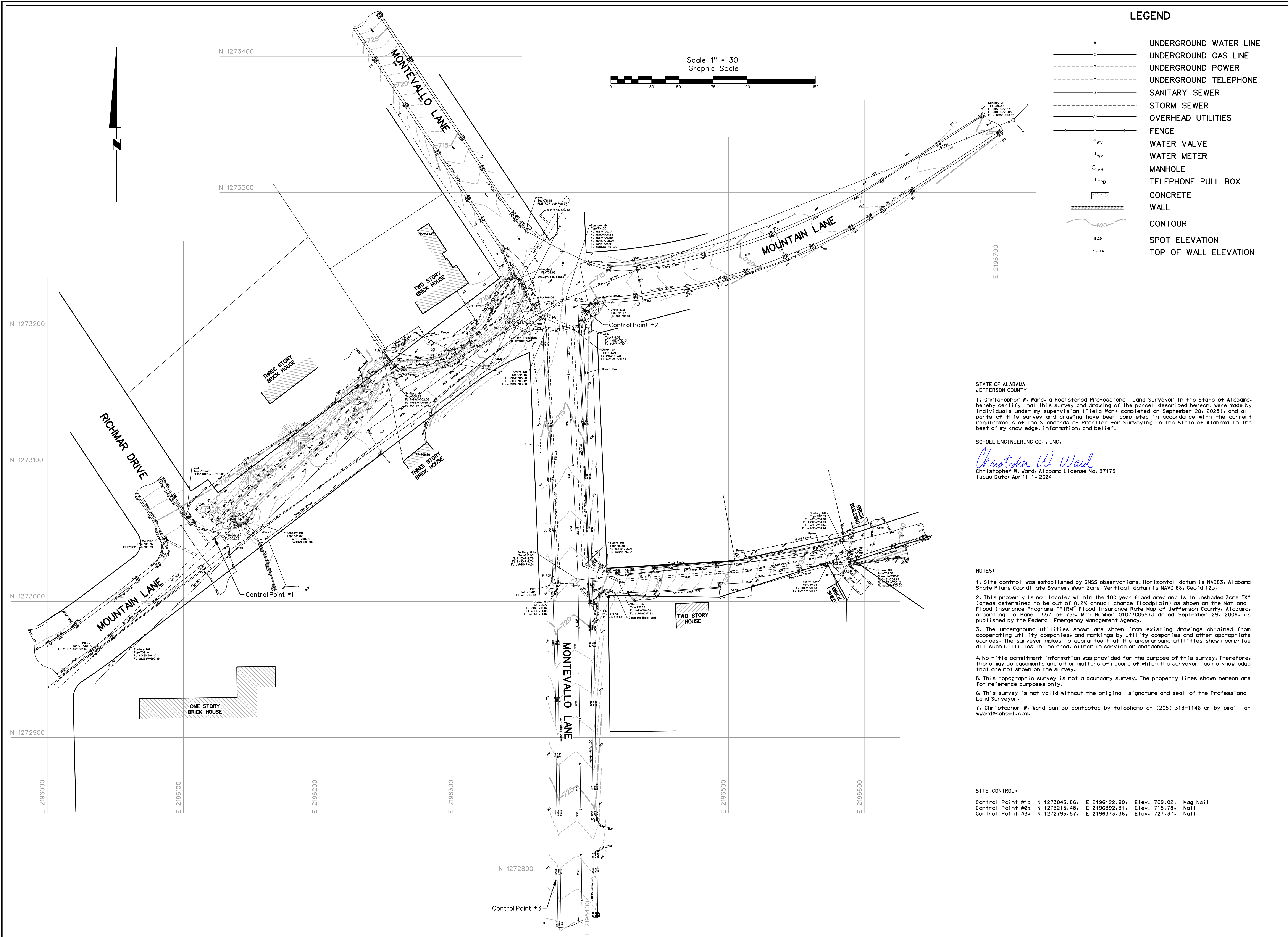
N.T.S.

OWNER

CITY OF MOUNTAIN BROOK
56 CHURCH STREET
MOUNTAIN BROOK, AL 35213
CONTACT: MR. SAM GASTON
PHONE: (205) 313-1149

CIVIL ENGINEER

SCHOEL ENGINEERING COMPANY, INC.
1001 22ND STREET SOUTH
BIRMINGHAM, AL 35205
CONTACT: MARK E. SIMPSON
PHONE: (205) 323-6166



LEGEND

- W — UNDERGROUND WATER LINE
- G — UNDERGROUND GAS LINE
- - - P - - - UNDERGROUND POWER
- - - T - - - UNDERGROUND TELEPHONE
- - - S - - - SANITARY SEWER
- - - ST - - - STORM SEWER
- - - OU - - - OVERHEAD UTILITIES
- X — FENCE
- WV WATER VALVE
- WM WATER METER
- MH MANHOLE
- TPB TELEPHONE PULL BOX
- CONCRETE
- WALL
- 620 — CONTOUR
- 16.29 SPOT ELEVATION
- 16.29TW TOP OF WALL ELEVATION

STATE OF ALABAMA
JEFFERSON COUNTY

I, Christopher W. Ward, a Registered Professional Land Surveyor in the State of Alabama, hereby certify that this survey and drawing of the parcel described hereon, were made by individuals under my supervision (Field Work completed on September 28, 2023), and all parts of this survey and drawing have been completed in accordance with the current requirements of the Standards of Practice for Surveying in the State of Alabama to the best of my knowledge, information, and belief.

SCHOEL ENGINEERING CO., INC.

Christopher W. Ward
Christopher W. Ward, Alabama License No. 37175
Issue Date: April 11, 2024

NOTES:

1. Site control was established by GNSS observations. Horizontal datum is NAD83, Alabama State Plane Coordinate System, West Zone. Vertical datum is NAVD 88, Geoid 12b.
2. This property is not located within the 100 year flood area and is in Unshaded Zone "X" (areas determined to be out of 0.2% annual chance floodplain) as shown on the National Flood Insurance Program "FIRM" Flood Insurance Rate Map of Jefferson County, Alabama, according to Panel 557 of 755, Map Number 0107300557J dated September 29, 2006, as published by the Federal Emergency Management Agency.
3. The underground utilities shown are shown from existing drawings obtained from cooperating utility companies, and markings by utility companies and other appropriate sources. The surveyor makes no guarantee that the underground utilities shown comprise all such utilities in the area, either in service or abandoned.
4. No title commitment information was provided for the purpose of this survey. Therefore, there may be easements and other matters of record of which the surveyor has no knowledge that are not shown on the survey.
5. This topographic survey is not a boundary survey. The property lines shown hereon are for reference purposes only.
6. This survey is not valid without the original signature and seal of the Professional Land Surveyor.
7. Christopher W. Ward can be contacted by telephone at (205) 313-1146 or by email at ward@schoel.com.

SITE CONTROL:

Control Point #1: N 1273045.86, E 2196122.90, Elev. 709.02, Mag Nail
Control Point #2: N 1273215.48, E 2196332.31, Elev. 715.78, Nail
Control Point #3: N 1272795.57, E 2196373.36, Elev. 727.37, Nail

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**MOUNTAIN LN AND MONTEVALLO LN
AREA DRAINAGE IMPROVEMENTS
MOUNTAIN BROOK, ALABAMA**

DRAWING SET:
BID SET 04/24/24
REVISIONS:

**TOPOGRAPHIC
SURVEY**

DATE: APRIL 2024
DRAWN BY: WTM
CHECKED BY: CWW
FIELD BOOK: #3309, 3324
FIELD CREW: JSG
FILE NAME: 23209_Working Topo
g/23/209/Survey/Topo

- UTILITY CONTACTS**
- 1. WATER**
BIRMINGHAM WATER WORKS BOARD
NAME - DOUG STOCKHAM
PHONE - 205-244-4186
EMAIL - DOUG.STOCKHAM@BWWB.ORG
 - 2. POWER**
ALABAMA POWER COMPANY
NAME - RYAN TUCKER
PHONE - 205-226-1160
EMAIL - RYTUCKER@SOUTHERNCO.COM
 - 3. COMMUNICATION**
AT&T
NAME - MARK SLOVENSKY
PHONE - 205-613-4433
EMAIL - MS435J@ATT.COM
 - 4. SPECTRUM/CHARTER**
NAME - NATE PIERCE
PHONE - 205-365-7199
EMAIL - NATHANIEL.PIERCE@CHARTER.COM
 - 5. SANITARY SEWER**
JEFFERSON COUNTY ENVIRONMENTAL SERVICES
NAME - EMILY KEMP
PHONE - 205-214-8608
EMAIL - KEMPE@JCCAL.ORG
 - 6. GAS**
ALAGASCO/SPIRE ENERGY
NAME - MIKE GORENFLO
PHONE - 334-202-9867
EMAIL - MIKE.GORENFLO@SPIREENERGY.COM

NOTE:
CONTRACTOR TO CONTACT RICKY PENNINGTON WITH JEFFERSON COUNTY AT LEAST 24-48 HOURS PRIOR TO BEGINNING WORK ON SANITARY MANHOLE. 205-325-5127

GENERAL DEMOLITION NOTES:

ALL SANITARY SEWER WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE STANDARDS OF THE JEFFERSON COUNTY ENVIRONMENTAL SERVICES, JEFFERSON COUNTY DEPT. OF HEALTH, AND THE ALABAMA DEPT. OF HEALTH.

UNLESS OTHERWISE INDICATED, PROTECT ALL UTILITY LINES AND STRUCTURES THAT COULD BE AFFECTED BY THE DEMOLITION.

KEEP ADJACENT BUILDINGS, PROPERTY, AND OTHER ITEMS FREE FROM DISTURBANCE DURING ALL WORK.

CONTRACTOR SHALL CONTACT ALL UTILITY COMPANIES FOR FIELD LOCATIONS OF ALL UTILITIES PRIOR TO THE START OF WORK.

CONTRACTOR SHALL BE REQUIRED TO OBTAIN AND PAY FOR ALL PERMITS, NECESSARY TO PERFORM THE WORK.

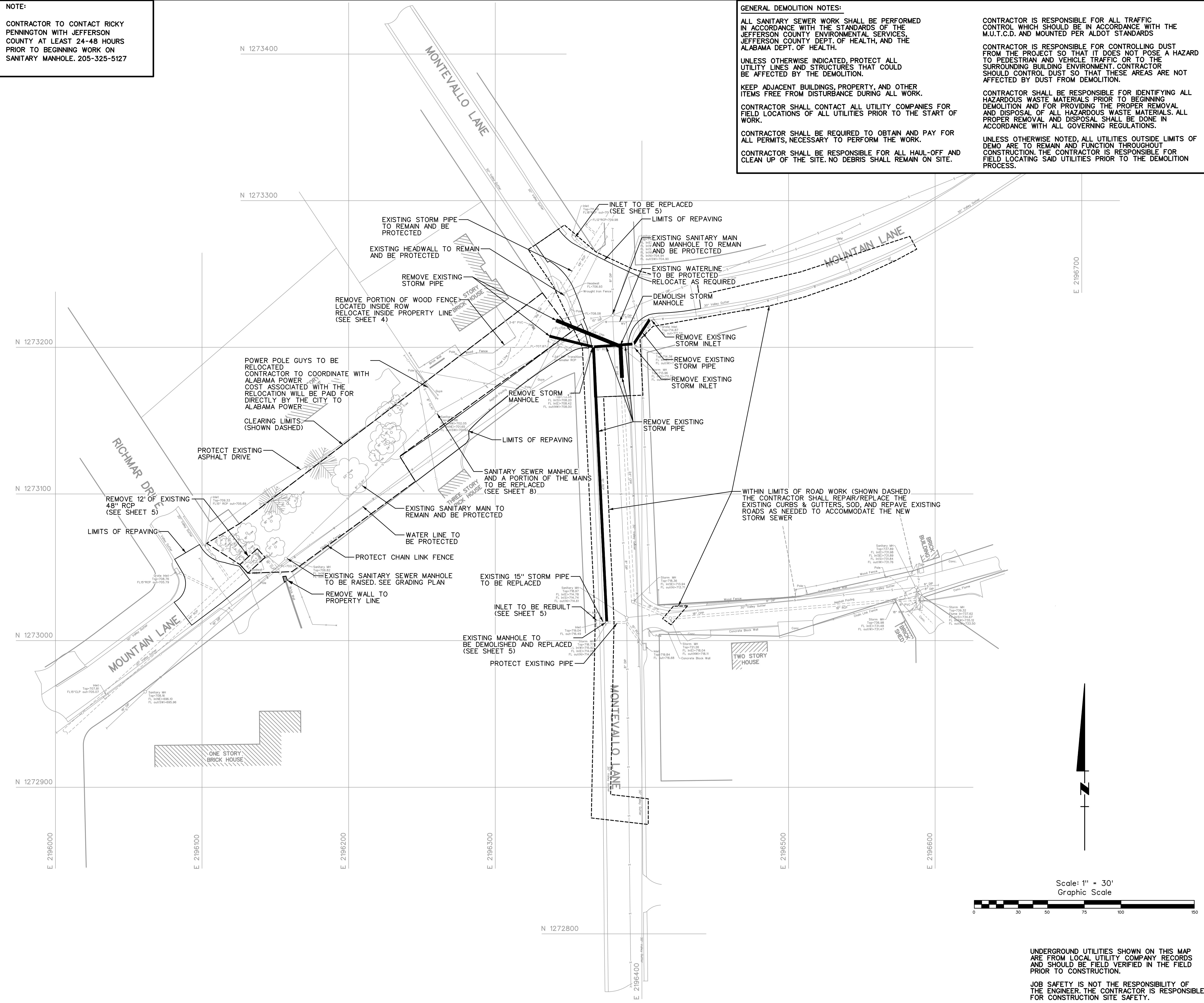
CONTRACTOR SHALL BE RESPONSIBLE FOR ALL HAUL-OFF AND CLEAN UP OF THE SITE. NO DEBRIS SHALL REMAIN ON SITE.

CONTRACTOR IS RESPONSIBLE FOR ALL TRAFFIC CONTROL WHICH SHOULD BE IN ACCORDANCE WITH THE M.U.T.C.D. AND MOUNTED PER ALDOT STANDARDS

CONTRACTOR IS RESPONSIBLE FOR CONTROLLING DUST FROM THE PROJECT SO THAT IT DOES NOT POSE A HAZARD TO PEDESTRIAN AND VEHICLE TRAFFIC OR TO THE SURROUNDING BUILDING ENVIRONMENT. CONTRACTOR SHOULD CONTROL DUST SO THAT THESE AREAS ARE NOT AFFECTED BY DUST FROM DEMOLITION.

CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING ALL HAZARDOUS WASTE MATERIALS PRIOR TO BEGINNING DEMOLITION AND FOR PROVIDING THE PROPER REMOVAL AND DISPOSAL OF ALL HAZARDOUS WASTE MATERIALS. ALL PROPER REMOVAL AND DISPOSAL SHALL BE DONE IN ACCORDANCE WITH ALL GOVERNING REGULATIONS.

UNLESS OTHERWISE NOTED, ALL UTILITIES OUTSIDE LIMITS OF DEMO ARE TO REMAIN AND FUNCTION THROUGHOUT CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR FIELD LOCATING SAID UTILITIES PRIOR TO THE DEMOLITION PROCESS.



SCHOEL

BIRMINGHAM HUNTSVILLE TUSCALOOSA

1001 22nd Street South, Birmingham, AL 35202
1001 Washington Street, Huntsville, AL 35893
3800 Westover Road, Tuscaloosa, AL 35402

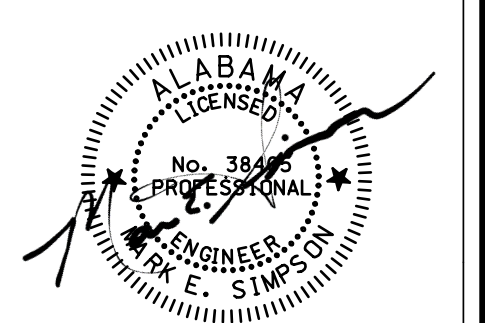
205.323.8199 205.323.8199 205.323.8199

BIRMINGHAM HUNTSVILLE TUSCALOOSA

1001 22nd Street South, Birmingham, AL 35202
1001 Washington Street, Huntsville, AL 35893
3800 Westover Road, Tuscaloosa, AL 35402

205.323.8199 205.323.8199 205.323.8199

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**MOUNTAIN LN AND MONTEVALLO LN
AREA DRAINAGE IMPROVEMENTS
MOUNTAIN BROOK, ALABAMA**

DRAWING SET:

BID SET 04/24/24

REVISIONS:

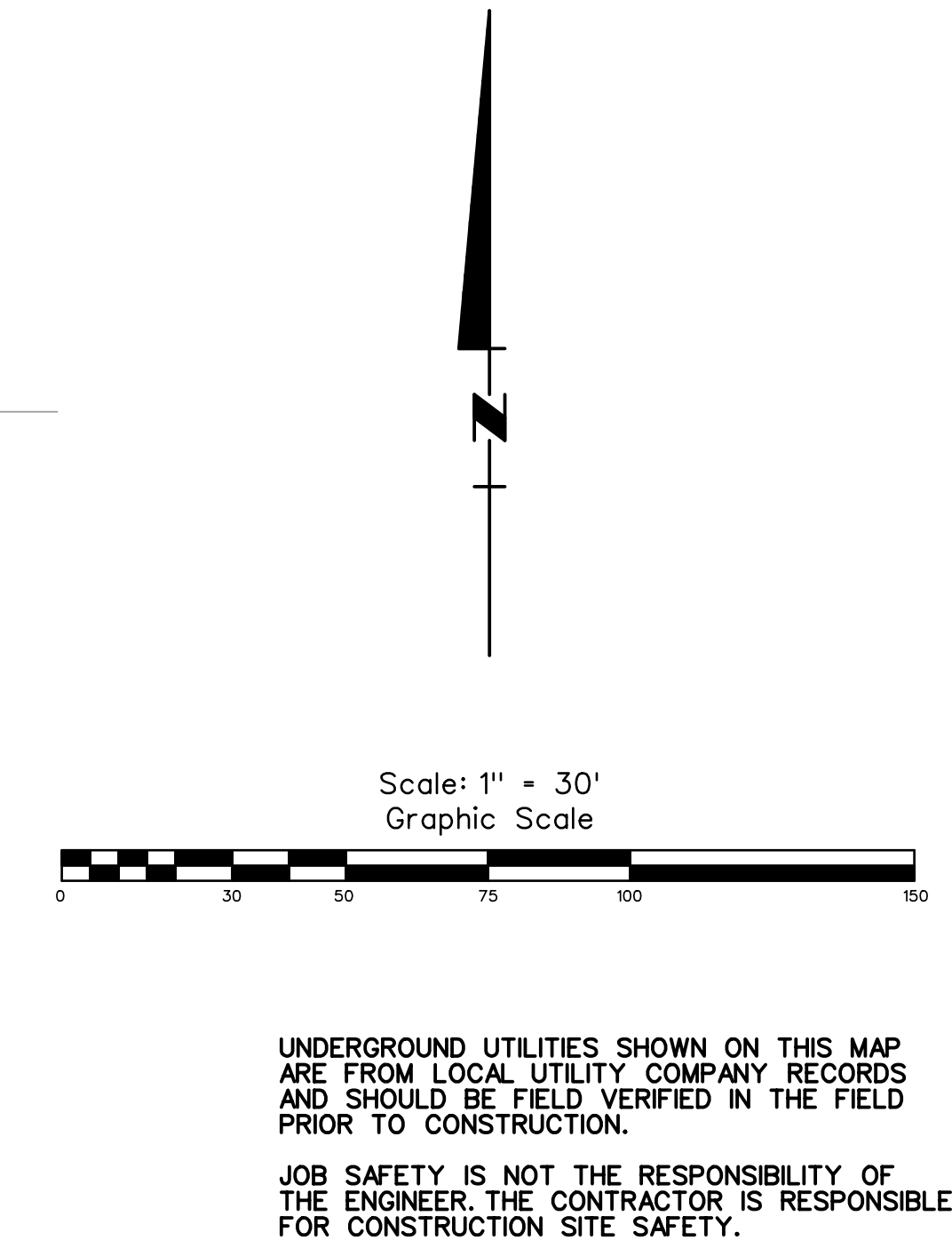
DEMOLITION PLAN

DRAWN BY: K.D.
CHECKED BY: M.E.S.
FILE NAME: 23209-DP1

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3

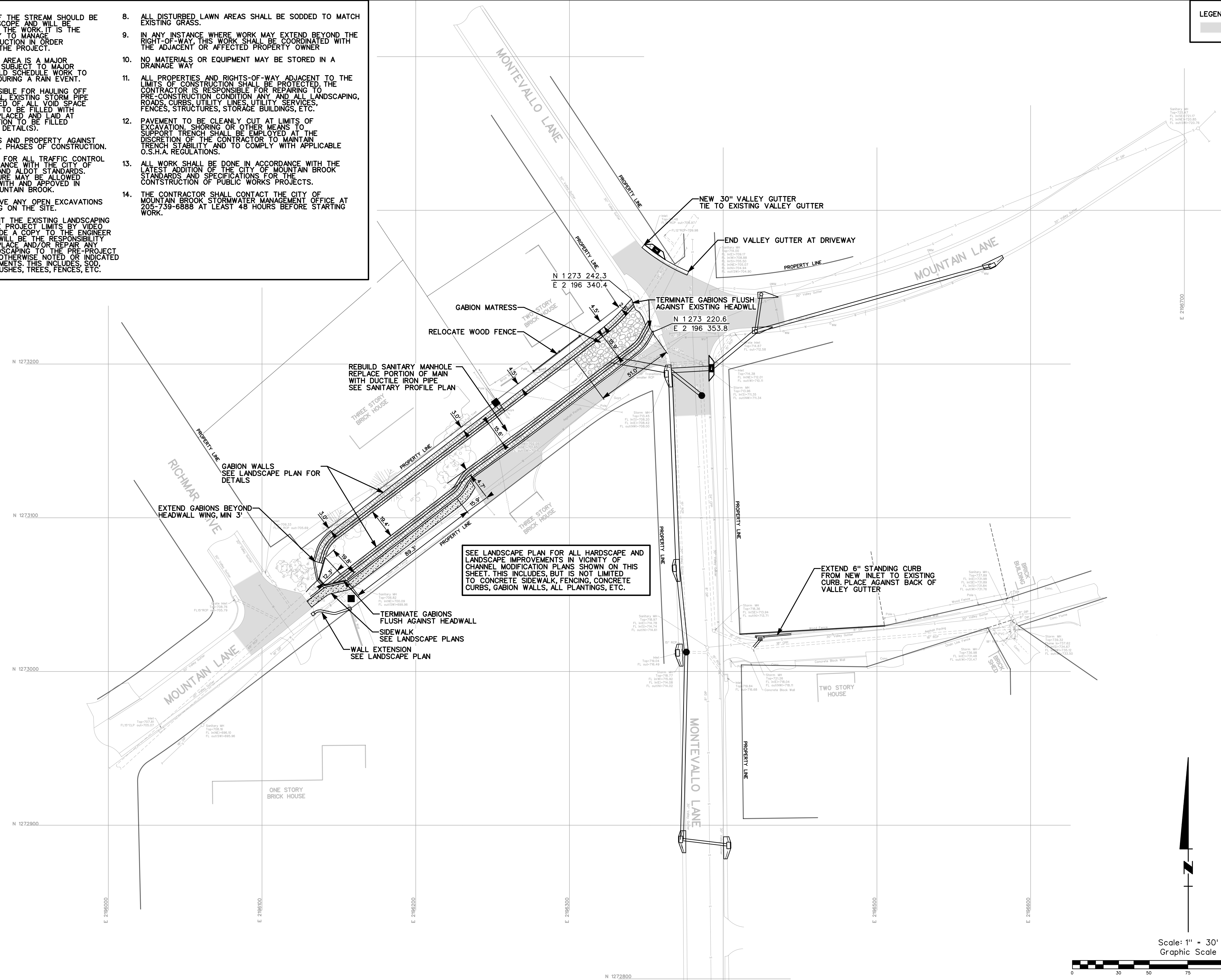
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- NOTES:**
- STORMWATER MANAGEMENT OF THE STREAM SHOULD BE INCLUDED IN CONTRACTOR'S SCOPE AND WILL BE INCIDENTAL TO THE COST OF THE WORK. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MANAGE STORMWATER DURING CONSTRUCTION IN ORDER TO PERFORM THE WORK OF THE PROJECT.
 - IT IS UNDERSTOOD THAT THE AREA IS A MAJOR DRAINAGE PATH AND MAY BE SUBJECT TO MAJOR FLOODING. CONTRACTOR SHOULD SCHEDULE WORK TO ENSURE SUFFICIENT SAFETY DURING A RAIN EVENT.
 - THE CONTRACTOR IS RESPONSIBLE FOR HAULING OFF EXCESS AND UNUSED MATERIAL. EXISTING STORM PIPE TO BE REMOVED AND DISPOSED OF. ALL VOID SPACE BELOW EXISTING PIPE GRADE TO BE FILLED WITH #57 STONE PIPES TO BE REPLACED AND LAID AT THE GRADES SHOWN. EXCAVATION TO BE FILLED FULL DEPTH AS PER TRENCH DETAIL(S).
 - PROTECT ADJACENT BUILDINGS AND PROPERTY AGAINST POSSIBLE DAMAGE DURING ALL PHASES OF CONSTRUCTION.
 - CONTRACTOR IS RESPONSIBLE FOR ALL TRAFFIC CONTROL WHICH SHOULD BE IN ACCORDANCE WITH THE CITY OF MOUNTAIN BROOK, M.U.T.C.D. AND ADOT STANDARDS. A COMPLETE ROADWAY CLOSURE MAY BE ALLOWED AND MUST BE COORDINATED WITH AND APPROVED IN WRITING BY THE CITY OF MOUNTAIN BROOK.
 - CONTRACTOR SHALL NOT LEAVE ANY OPEN EXCAVATIONS WHEN NOT ACTIVELY WORKING ON THE SITE.
 - CONTRACTOR SHALL DOCUMENT THE EXISTING LANDSCAPING AND HARDSCAPING WITHIN THE PROJECT LIMITS BY VIDEO AND/OR PICTURES AND PROVIDE A COPY TO THE ENGINEER PRIOR TO CONSTRUCTION. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REPLACE AND/OR REPAIR ANY DAMAGED OR DISTURBED LANDSCAPING TO THE PRE-PROJECT CONDITION UNLESS OTHERWISE NOTED OR INDICATED ON THE CONSTRUCTION DOCUMENTS. THIS INCLUDES, SOD, ORNAMENTAL SHRUBS AND BUSHES, TREES, FENCES, ETC.
 - ALL DISTURBED LAWN AREAS SHALL BE SODDED TO MATCH EXISTING GRASS.
 - IN ANY INSTANCE WHERE WORK MAY EXTEND BEYOND THE RIGHT-OF-WAY THIS WORK SHALL BE COORDINATED WITH THE ADJACENT OR AFFECTED PROPERTY OWNER.
 - NO MATERIALS OR EQUIPMENT MAY BE STORED IN A DRAINAGE WAY.
 - ALL PROPERTIES AND RIGHTS-OF-WAY ADJACENT TO THE LIMITS OF CONSTRUCTION SHALL BE PROTECTED. THE CONTRACTOR IS RESPONSIBLE FOR REPAIRING TO PRE-CONSTRUCTION CONDITION ANY AND ALL LANDSCAPING, ROADS, CURBS, UTILITY LINES, UTILITY SERVICES, FENCES, STRUCTURES, STORAGE BUILDINGS, ETC.
 - PAVEMENT TO BE CLEANLY CUT AT LIMITS OF EXCAVATION. SHORING OR OTHER MEANS TO SUPPORT TRENCH SHALL BE EMPLOYED AT THE DISCRETION OF THE CONTRACTOR TO MAINTAIN TRENCH STABILITY AND TO COMPLY WITH APPLICABLE O.S.H.A. REGULATIONS.
 - ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE LATEST ADDITION OF THE CITY OF MOUNTAIN BROOK STANDARDS AND SPECIFICATIONS FOR THE CONSTRUCTION OF PUBLIC WORKS PROJECTS.
 - THE CONTRACTOR SHALL CONTACT THE CITY OF MOUNTAIN BROOK STORMWATER MANAGEMENT OFFICE AT 205-739-6888 AT LEAST 48 HOURS BEFORE STARTING WORK.

LEGEND

ASPHALT PAVING



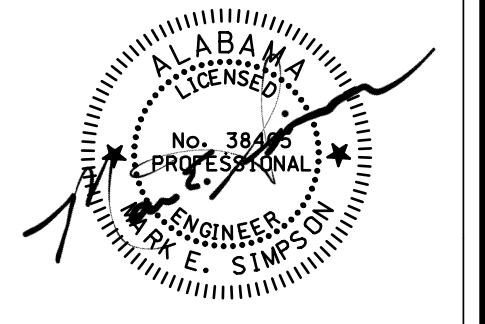
SCHOEL

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3800 Waterford Road, Box 202
Tuscaloosa, AL 35402
256.323.9199

HUNTSVILLE
121 Washington Street, SE
Huntsville, AL 35894
256.539.1227

BIRMINGHAM
1001 22nd Street South, #1205
Birmingham, AL 35205
205.323.9199

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**MOUNTAIN LN AND MONTEVALLO LN
AREA DRAINAGE IMPROVEMENTS
MOUNTAIN BROOK, ALABAMA**

DRAWING SET:
 BID SET 04/24/24
 REVISIONS:

SITE LAYOUT PLAN

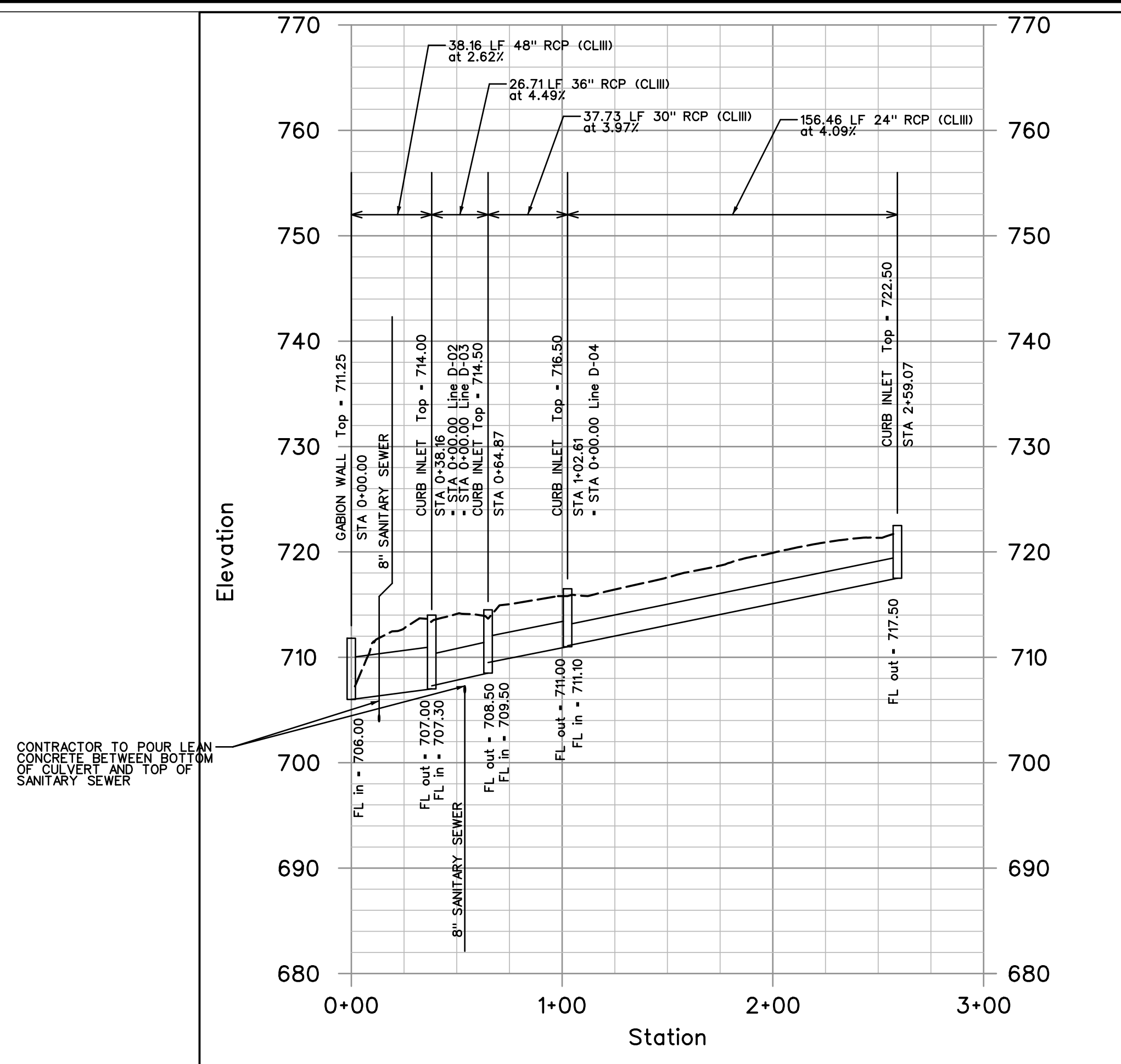
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 CHECKED BY: M.E.S.
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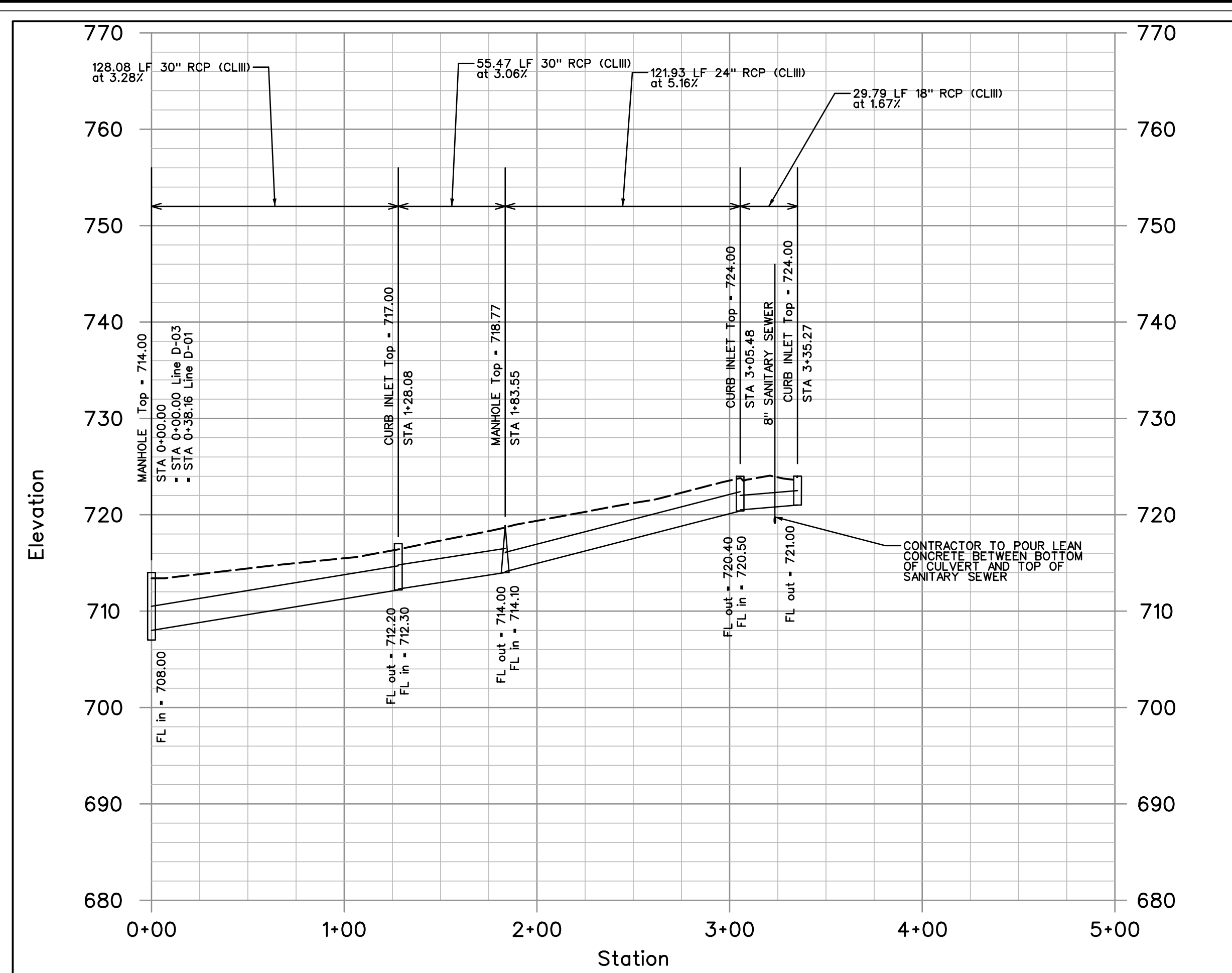
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 Graphic Scale

UNDERGROUND UTILITIES SHOWN ON THIS MAP ARE FROM LOCAL UTILITY COMPANY RECORDS AND SHOULD BE FIELD VERIFIED IN THE FIELD PRIOR TO CONSTRUCTION.

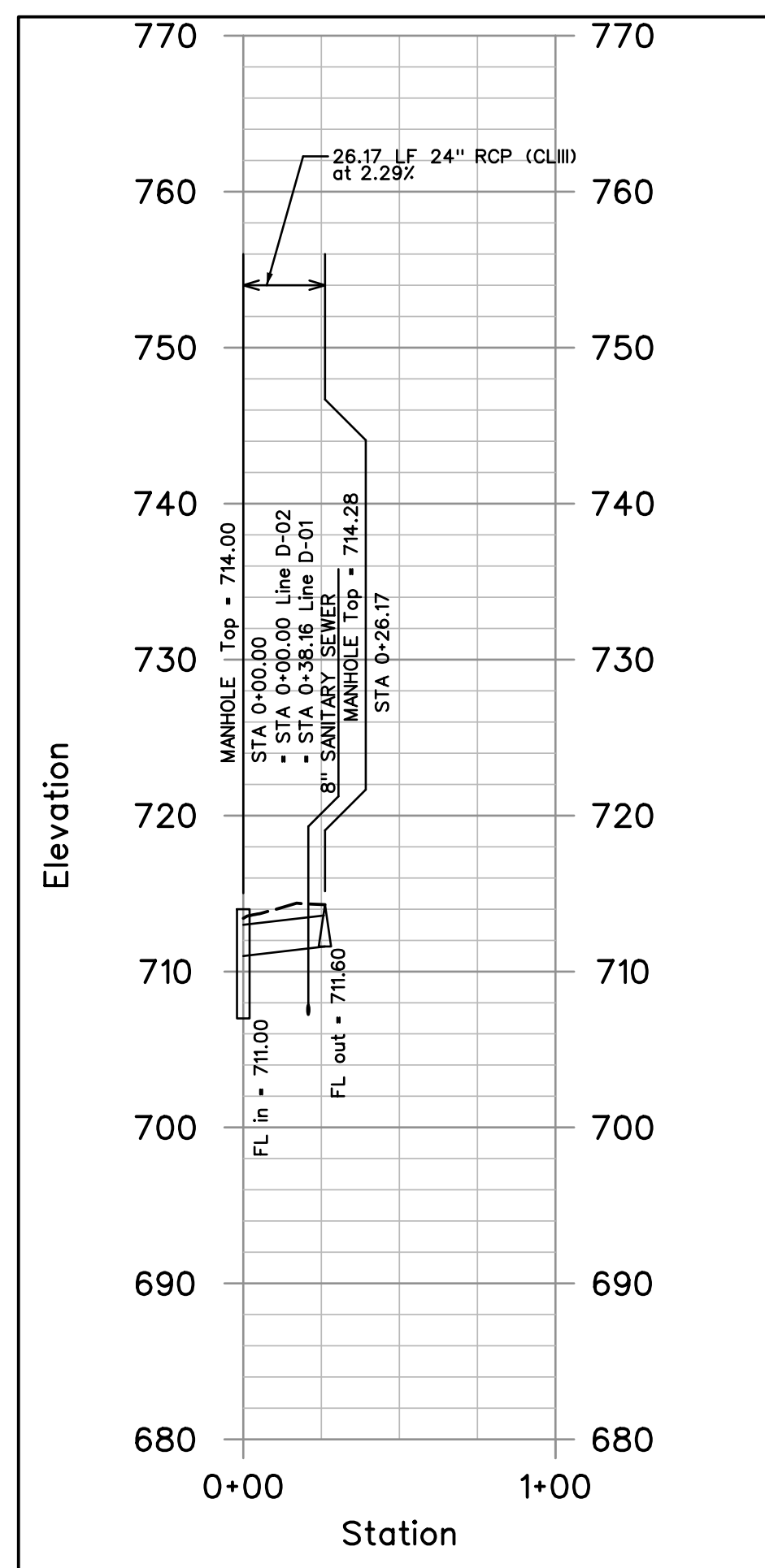
JOB SAFETY IS NOT THE RESPONSIBILITY OF THE ENGINEER. THE CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTION SITE SAFETY.



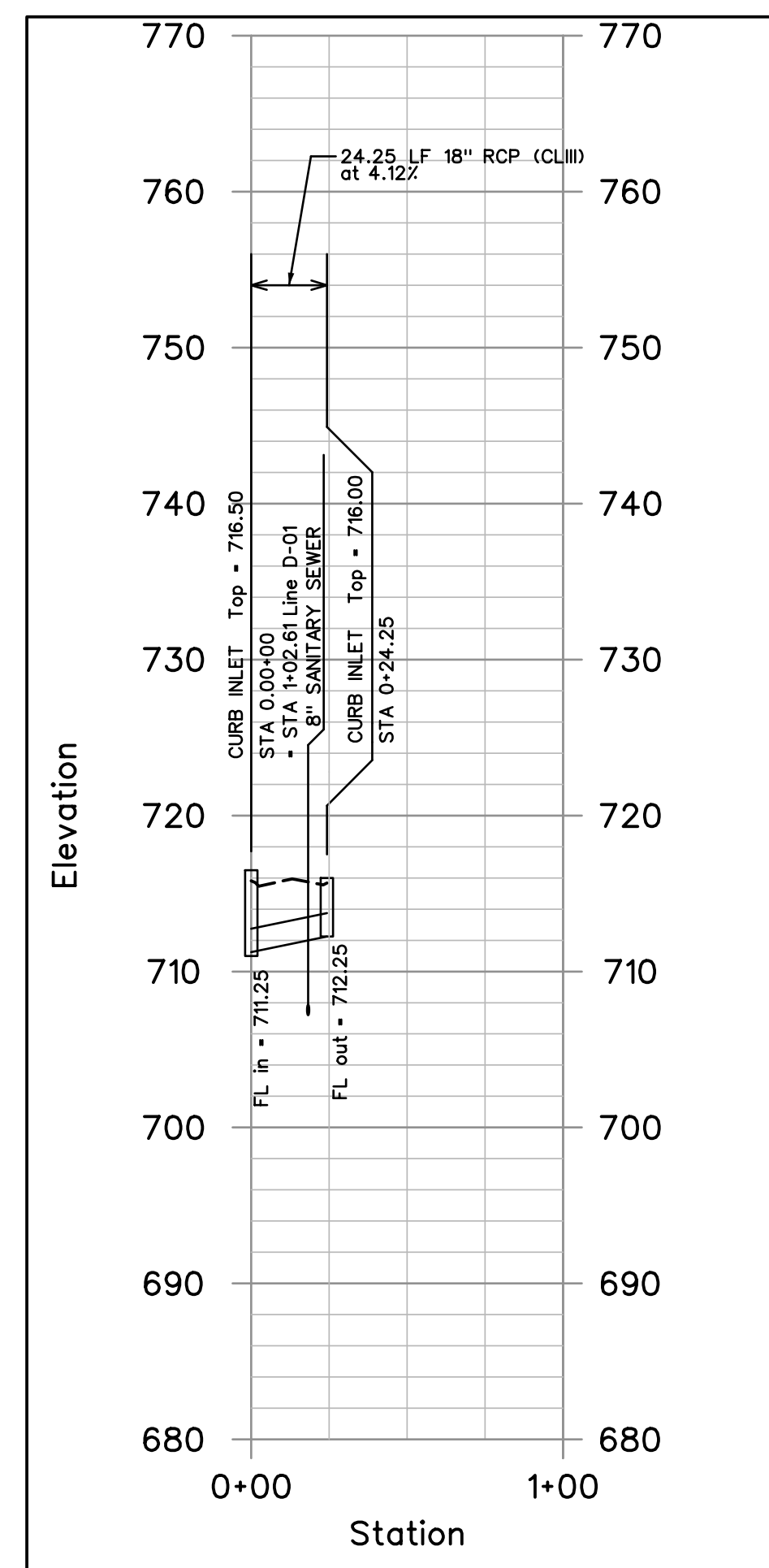
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SCALE 1"=50' HORZ.
SCALE 1"=10' VERT.



PROFILE STORM LINE D-02
SCALE 1"=50' HORZ.
SCALE 1"=10' VERT.



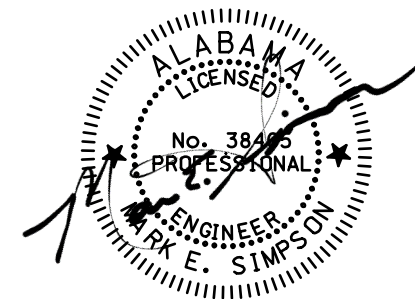
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SCALE 1"=10' VERT.



PROFILE STORM LINE D-04
SCALE 1"=50' HORZ.
SCALE 1"=10' VERT.

CONTRACTOR TO POUR LEAN CONCRETE BETWEEN BOTTOM OF CULVERT AND TOP OF SANITARY SEWER

CONTRACTOR TO POUR LEAN CONCRETE BETWEEN BOTTOM OF CULVERT AND TOP OF SANITARY SEWER



MOUNTAIN LN AND MONTEVALLO LN
AREA DRAINAGE IMPROVEMENTS
MOUNTAIN BROOK, ALABAMA

DRAWING SET:
BID SET 04/24/24
REVISIONS:

STORM
PROFILES

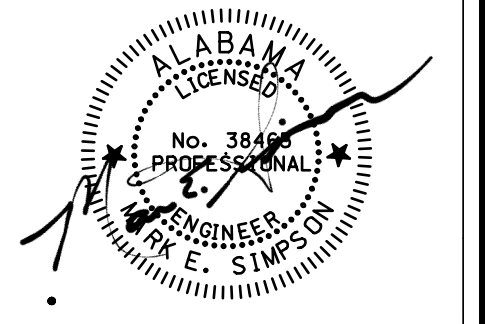
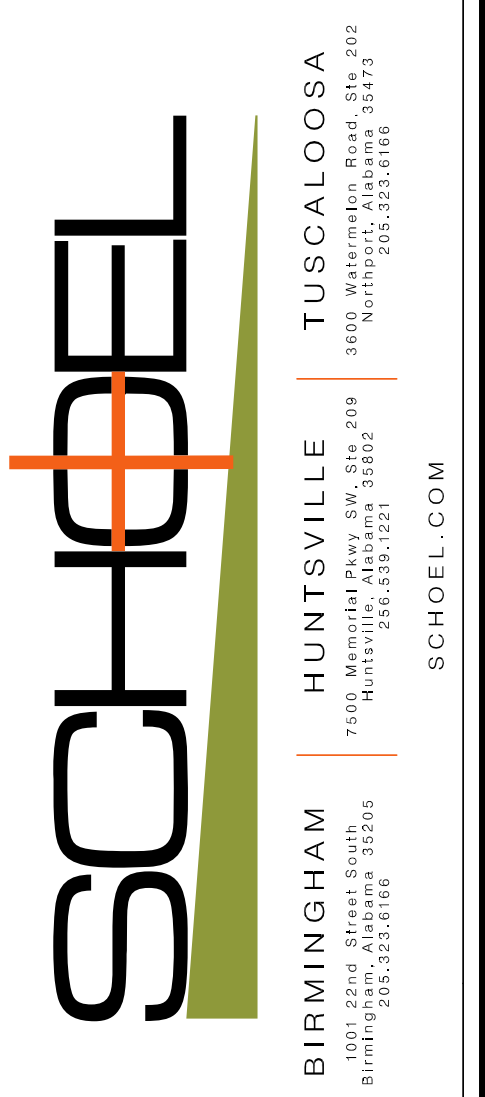
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CHECKED BY: M.E.S.
FILE NAME: 23209-STORMPRO1

UNDERGROUND UTILITIES SHOWN ON THIS MAP ARE FROM LOCAL UTILITY COMPANY RECORDS AND SHOULD BE FIELD VERIFIED IN THE FIELD PRIOR TO CONSTRUCTION.

JOB SAFETY IS NOT THE RESPONSIBILITY OF THE ENGINEER. THE CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTION SITE SAFETY.

OWNER:
SCHOEL
1001 22ND STREET SOUTH
BIRMINGHAM, AL 35205
CONTACT: MARK SIMPSON
PHONE: (205) 323-6166

OWNER:
CITY OF MOUNTAIN BROOK
56 CHURCH STREET
MOUNTAIN BROOK, AL 35213
CONTACT: SAM GASTON
PHONE: (205) 802-3800

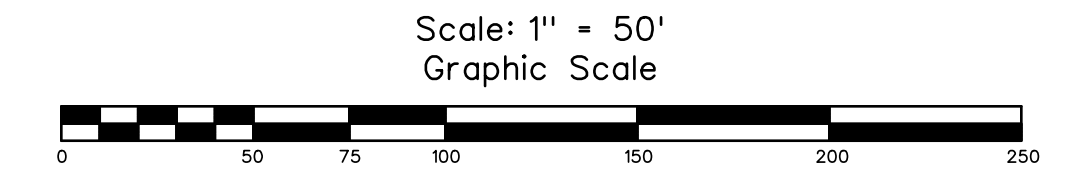


MOUNTAIN LN AND MONTEVALLO LN
AREA DRAINAGE IMPROVEMENTS
MOUNTAIN BROOK, ALABAMA

DRAWING SET:
BID SET 04/24/24
REVISIONS:

DRAWN BY: S.F.S.
CHECKED BY: M.E.S.
FILE NAME: 23209-SAN1
g:/23/209/Civil/Design

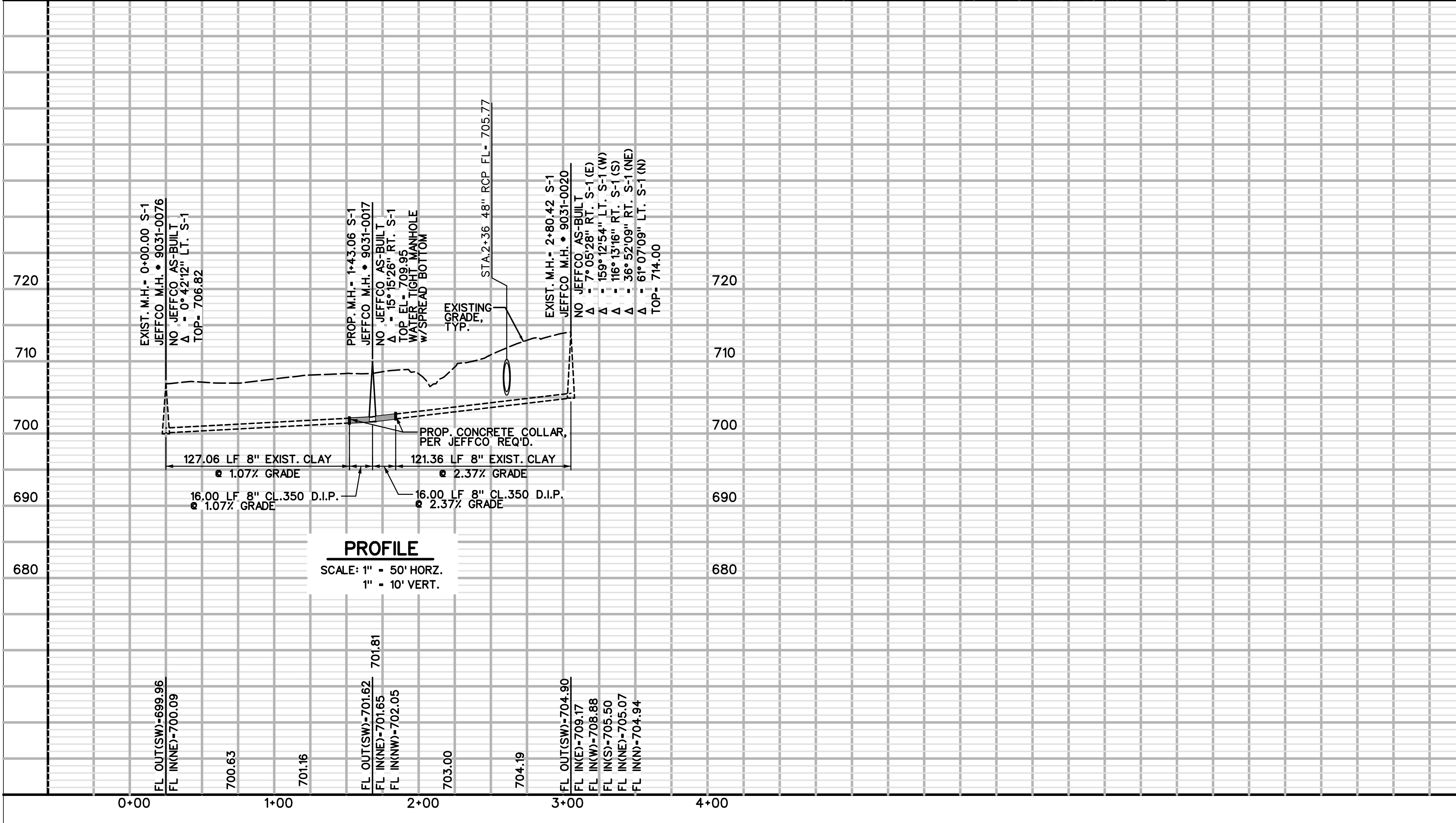
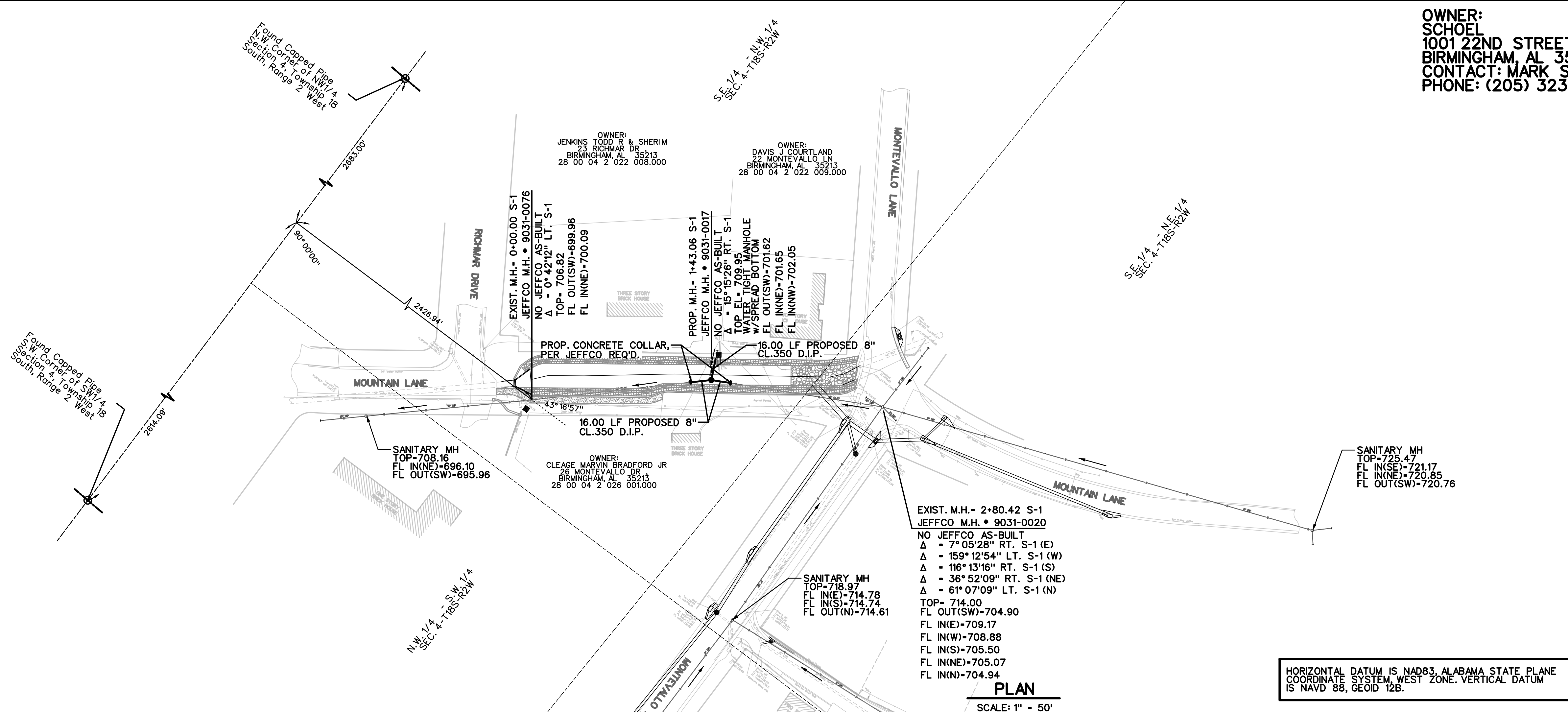
N.E. 1/4 OF SEC. 4-T18S-R2W
N.W. 1/4 OF SEC. 4-T18S-R2W
S.W. 1/4 OF SEC. 4-T18S-R2W



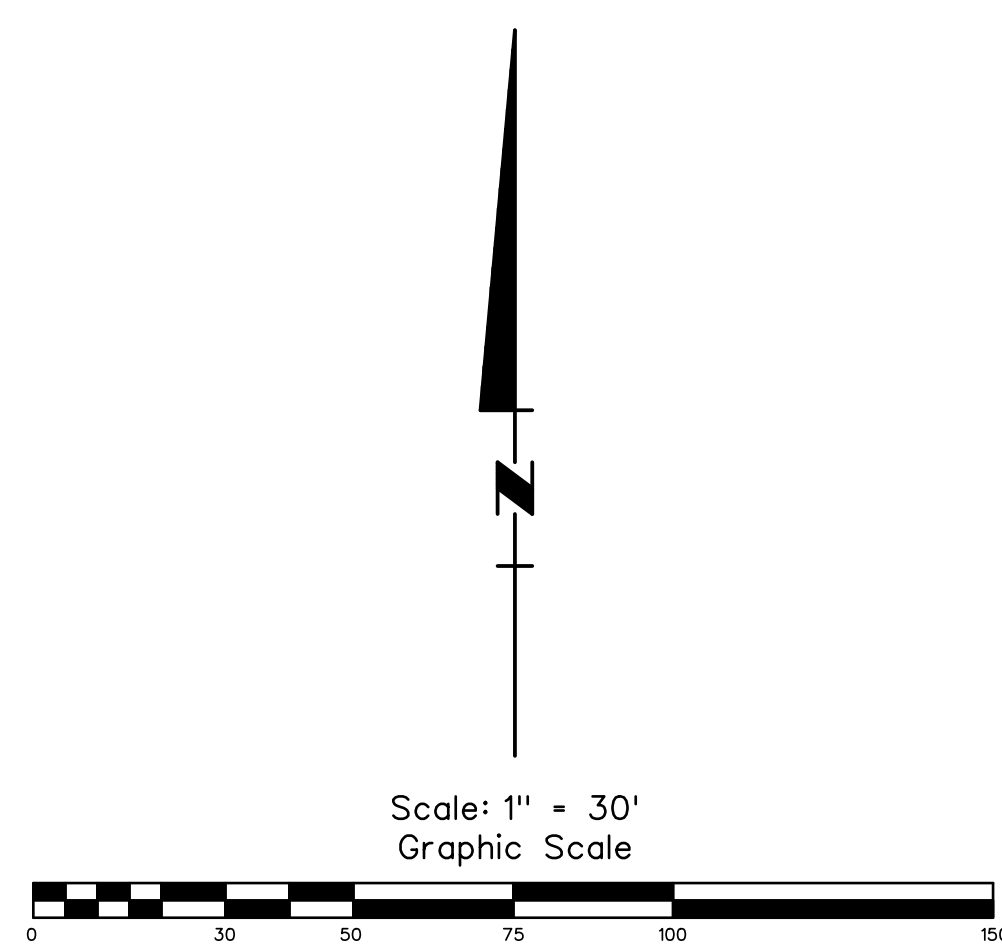
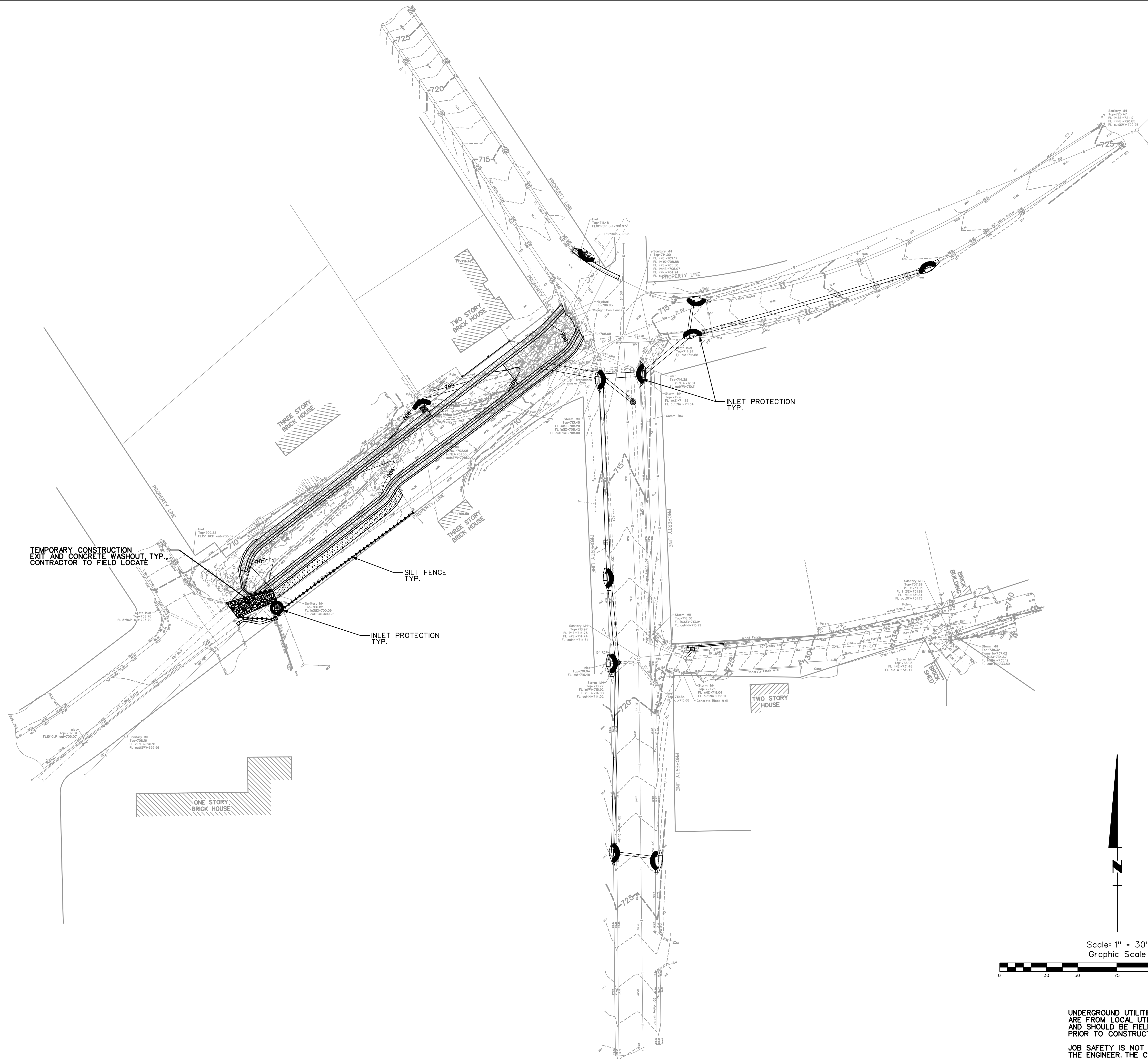
Scale: 1" = 50'
Graphic Scale

UNDERGROUND UTILITIES SHOWN ON THIS MAP ARE FROM LOCAL UTILITY COMPANY RECORDS AND SHOULD BE FIELD VERIFIED IN THE FIELD PRIOR TO CONSTRUCTION.

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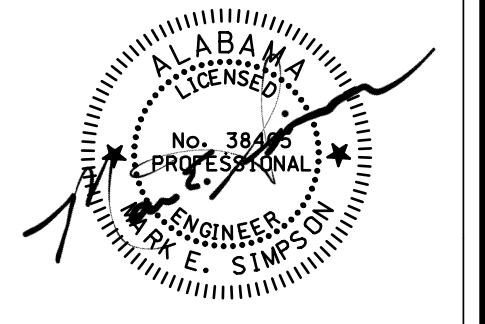


- Sanitary sewer work shall be done by a prequalified sewer contractor. All construction shall be in accordance with the standards and specification of Jefferson County, the local municipality and/or the State Highway Department, and applicable O.S.H.A. regulations, as applicable.
- The Contractor shall notify the Jefferson County Environmental Services Department (325-5127) at least 48 hours prior to beginning construction. There shall be no changes in Drawings without written approval by the Jefferson County Environmental Services Department.
- Ductile iron pipe shall be pressure sealed Class 350 or better.
- PVC pipe shall be AWWA C900, Cast Iron (CI) standard dimensions. Dimension Ratio (DR) 18. Pressure Class (PC) 150 psi or better.
- In earth trench, four inches of crushed stone shall be placed under sewer lines of 12 inches in diameter or smaller and six inches of crushed stone shall be placed under all sewers. In rock trenches, six inches of crushed stone shall be placed under all sewers. The ditch shall be backfilled with crushed stone to a depth of 12 inches above the top of the pipe. When crossing existing roads and streets, the total backfill shall be crushed stone and properly choked.
- At the direction of the ESD Inspector, a connection of Sanitary sewer pipes (8 inch through 16 inch) of dissimilar sizes or for repair of sanitary sewer pipes of similar materials may be made by means of an approved mechanical seal type adjustable coupling. Couplings with any required adapting bushings shall be manufactured of an approved preformed elastomeric material specifically for dimensions of the pipe materials to be connected. Couplings of the mechanical seal type shall have nut and bolt tightening clamps or devices made of 316 stainless steel, with an adjustable stainless steel shear ring, and stainless steel hardware. A concrete collar as shown on Appendix Standard Drawing SD2060 is required. The adjustable coupling shall be installed as recommended and specified by the manufacturer. Each coupling shall bear the manufacturer's name and required markings.
- Manholes shall meet ASTM specification C-478. Joints between the manhole sections shall be offset tongue and groove "push on" type, supplied with Tylox Super Seal pre-lubricated gasket as manufactured by Hamilton Kent meeting the requirements of ASTM C443. Each joint shall also be supplied with Con Seal CS-231 waterstop sealant as manufactured by Concrete Sealants, in widths as recommended by the manufacturer. Manholes shall have a minimum diameter of 48 inches and a minimum thickness of 5 inches. All manhole cones shall be of the concentric type. Manholes may be finished to street grade with brick and mortar. This adjustment height shall not exceed 6 inches.
- Stubouts for sanitary sewer service lines shall end on or near the property line unless otherwise noted. On "downhill" side lots install laterals on a minimum 1% grade. On "uphill" side lots, install service lines to grade that will terminate a maximum depth of 10 feet. The first joint out of a manhole, for building or house service, shall be ductile iron pipe class 52 or better (min. 8 feet). Any building service line set outside of easement or R.O.W. must be installed by a master plumber and have a sewer connection permit for each lot.
- If the contractor is installing service lines at the same time as main line, the service line shall be installed in accordance with Jefferson County Standards for Construction of Service Lines and Connections, and inspected/tested by County Inspector before it is backfilled.
- All service line stubouts installed in Road ROW or under asphalt shall be per Standard Specifications for Sanitary Sewer Service Lines and Connections Section 4.
- Construction signs for work within and adjacent to public roads, highways, and alleys shall be in accordance with ALDOT Standards.
- Contractor will be responsible for the continuous and proper operation of all existing utilities located on or adjacent to the project site and within the construction limits of this project.
- All embankment fill areas shall be filled and compacted prior to excavation of sewer line trenches.
- Contractor will be responsible for the construction and maintenance of erosion and sedimentation controls and for acquisition of all permits during construction to insure that damage does not occur to adjacent properties, public roads and/or ditches (creeks, streams).
- Upon completion of all or any part of a sanitary sewer line, the Contractor will be required to test said sewer for acceptability. Gravity sewers will be pressure tested with air. FORCE MAIN A sewers will be pressure tested with water. Manholes will be vacuum tested. All tests will be conducted in the presence of the County Sewer Construction Inspector in accordance with section 5.00 Standards for Commercial and Residential Construction of Sanitary Sewer Systems. Gravity Sanitary Sewers will be television inspected following air testings with the final video tape and log furnished to the County for record information.



UNDERGROUND UTILITIES SHOWN ON THIS MAP ARE FROM LOCAL UTILITY COMPANY RECORDS AND SHOULD BE FIELD VERIFIED IN THE FIELD PRIOR TO CONSTRUCTION.

JOB SAFETY IS NOT THE RESPONSIBILITY OF THE ENGINEER. THE CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTION SITE SAFETY.



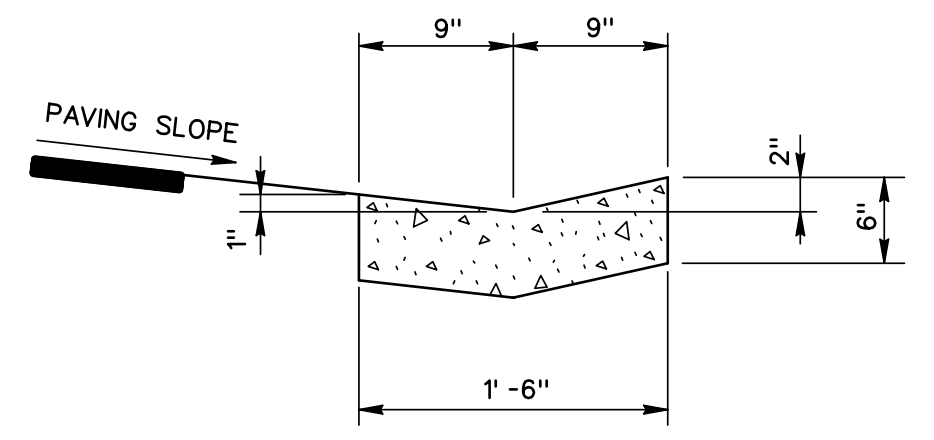
MOUNTAIN LN AND MONTEVALLO LN
AREA DRAINAGE IMPROVEMENTS
MOUNTAIN BROOK, ALABAMA

DRAWING SET:
 BID SET 04/24/24
 REVISIONS:

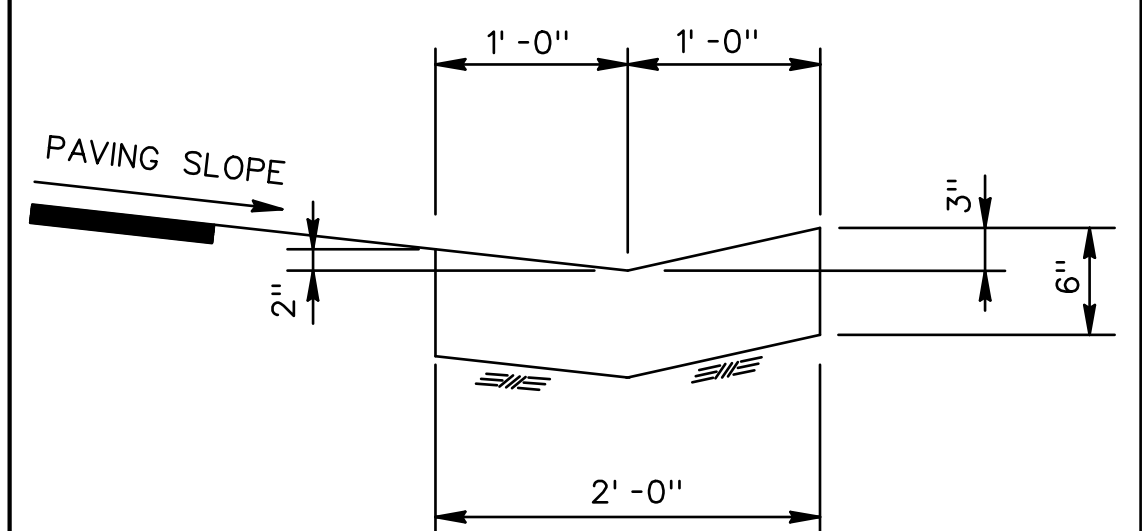
EROSION CONTROL PLAN

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 CHECKED BY: M.E.S.
 FILE NAME: 23209-EC1

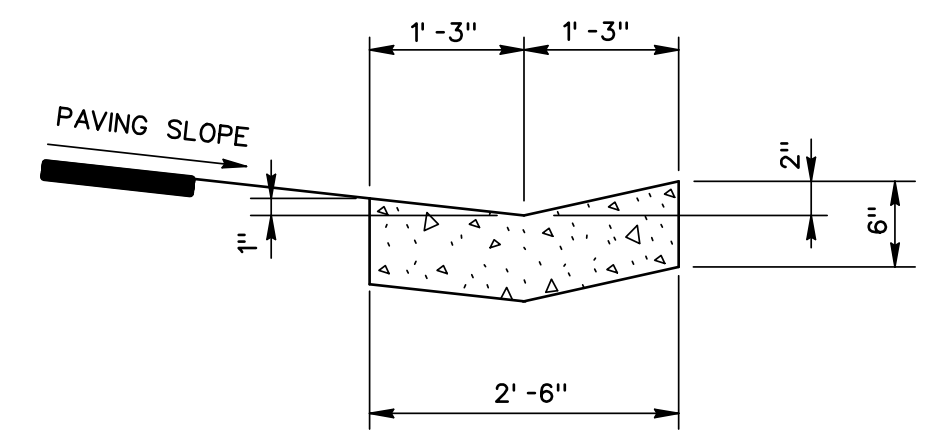
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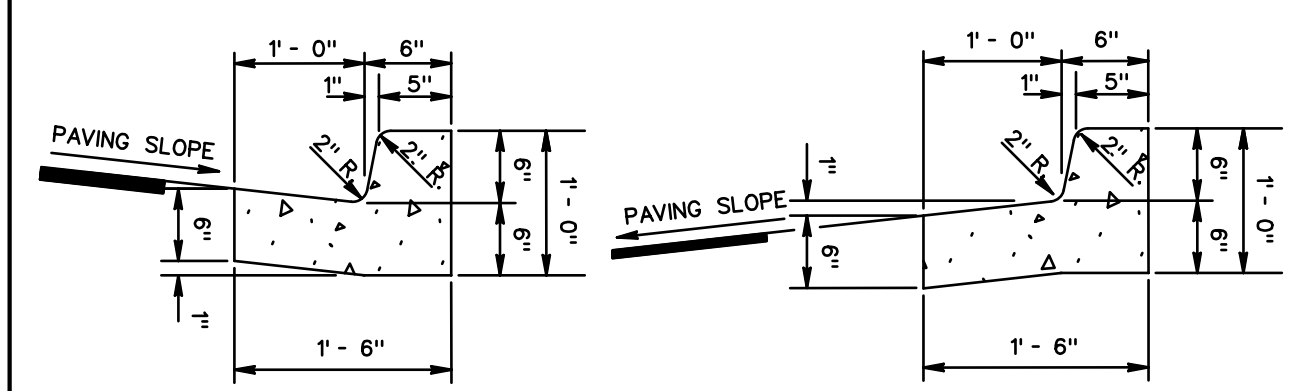
18" CONCRETE VALLEY GUTTER
N.T.S.



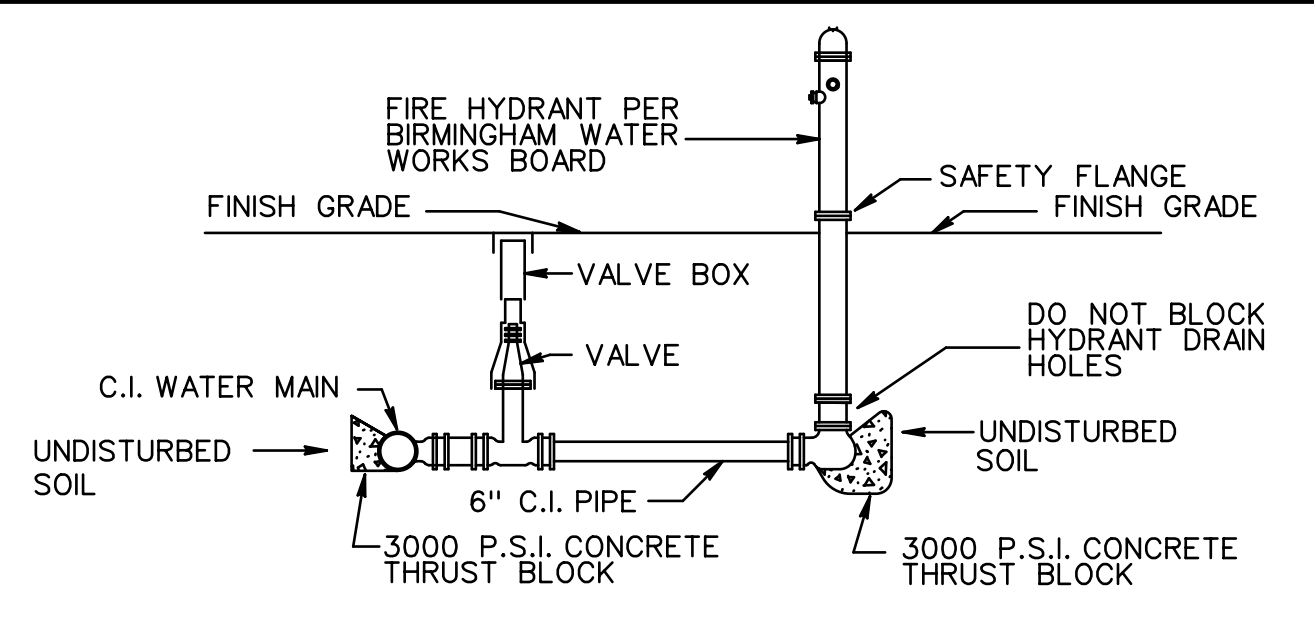
24" CONCRETE VALLEY GUTTER
N.T.S.



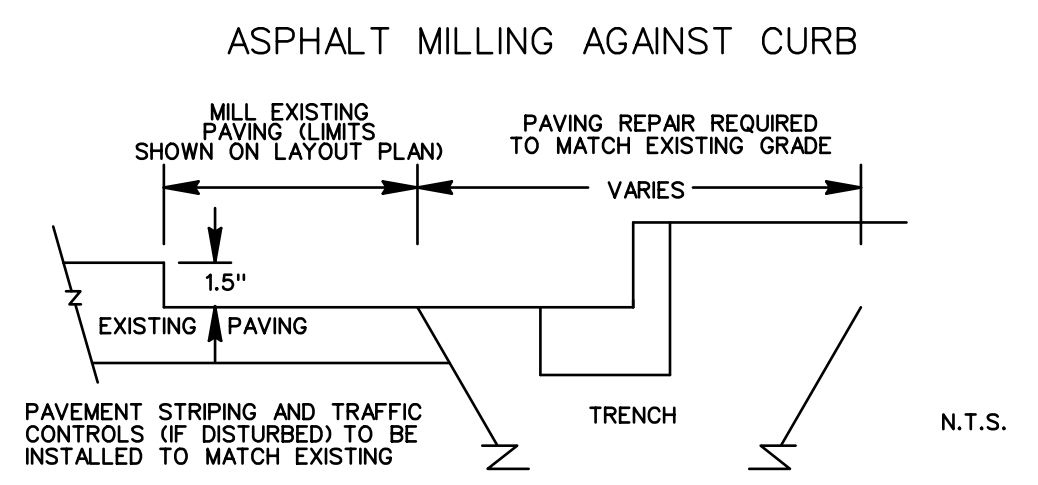
30" CONCRETE VALLEY GUTTER
N.T.S.



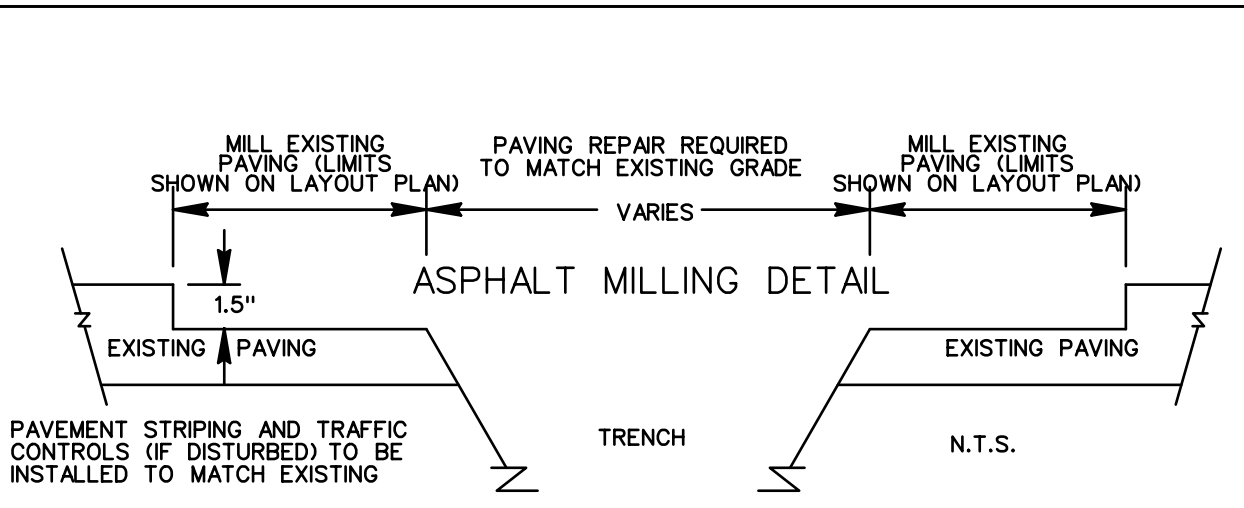
18" COMBINED CONCRETE CURB AND GUTTER
N.T.S.
NOTES: 1. SLOPE GUTTER AS SHOWN ACCORDING TO PAVING SLOPE.
2. 3/4" EXPANSION JOINT REQUIRED AT P.C.'S AND P.T.'S OF ALL CURVES, AT STRUCTURES (CURB INLETS, WHEELCHAIR RAMPS, ETC.) AND EVERY 100' MAX. WITH FILLER MATERIAL.
3. 3/8" SAWED JOINTS REQUIRED ON 20' INTERVALS.



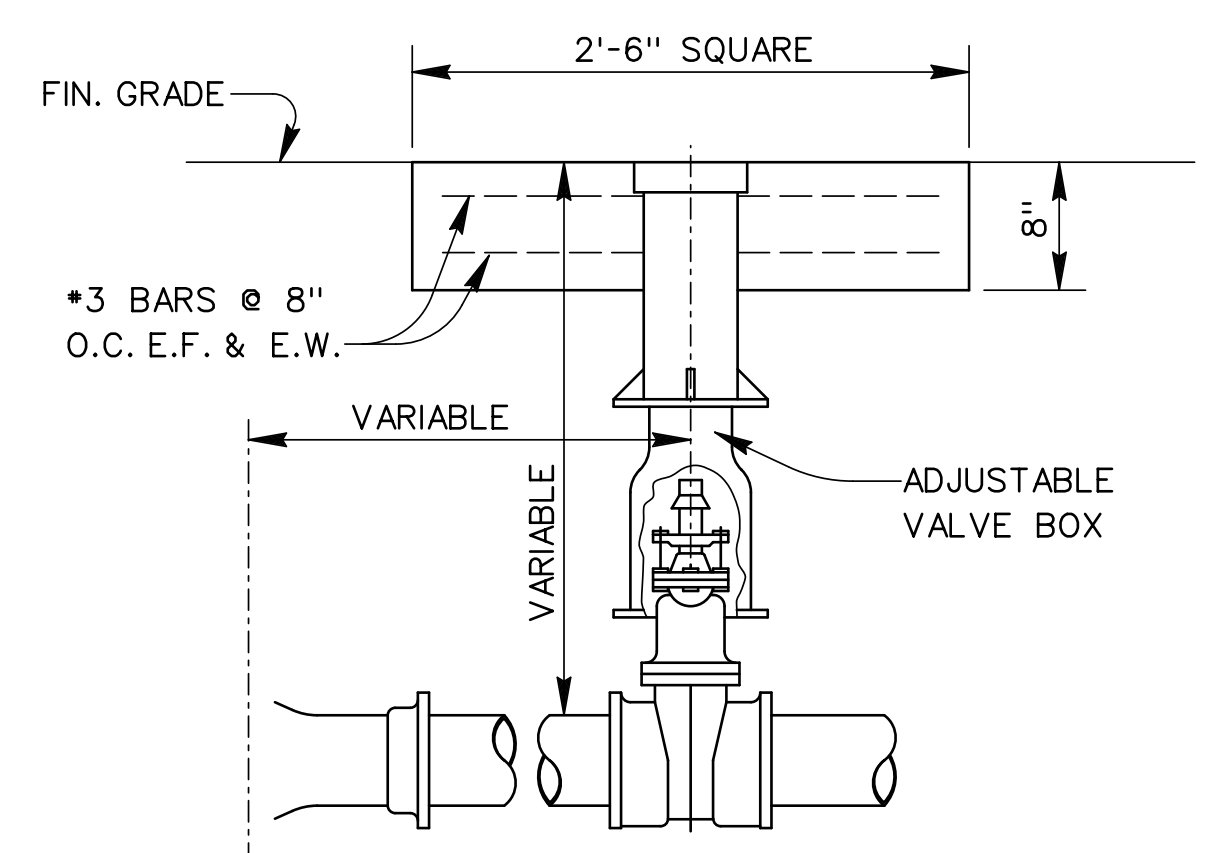
TYPICAL FIRE HYDRANT SETTING
N.T.S.



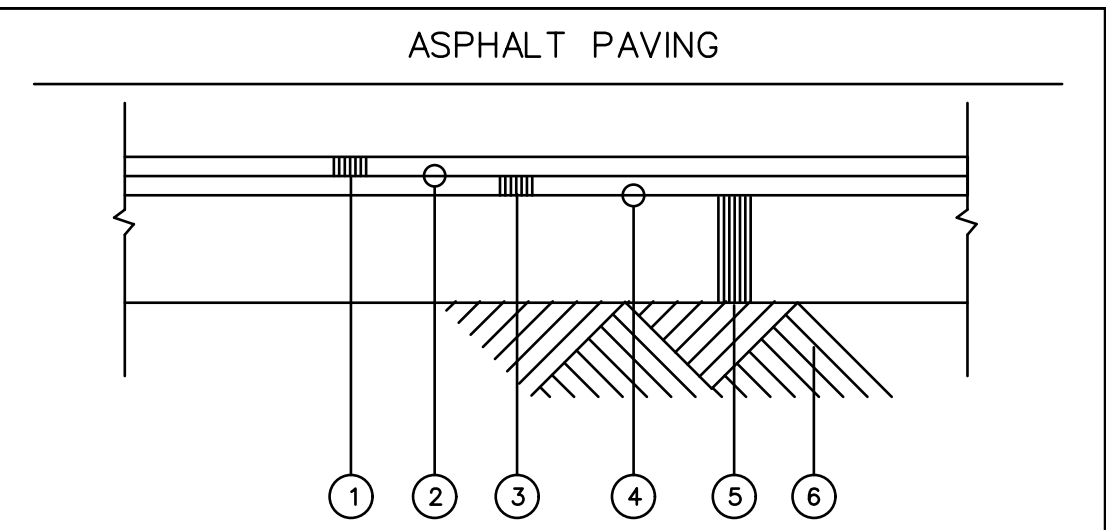
PAVEMENT MILLING TO BE FULL WIDTH FOR A FLUSH REPAIR. PAVEMENT TO BE MILLED 1.5" DEEP AND WIDTH AS SHOWN ON LAYOUT SHEETS. INCORPORATE LEVELING COURSE AS NEEDED TO MATCH PROFILE. EXISTING PAVING TO BE SWEEPED PRIOR TO ADDING TYPE A TREATMENT AND LEVELING COURSE. SEE DETAILS FOR PAVING SECTION OVER TRENCH EXCAVATION.



PAVEMENT MILLING TO BE FULL WIDTH FOR A FLUSH REPAIR. PAVEMENT TO BE MILLED 1.5" DEEP AND WIDTH AS SHOWN ON LAYOUT SHEETS. INCORPORATE LEVELING COURSE AS NEEDED TO MATCH PROFILE. EXISTING PAVING TO BE SWEEPED PRIOR TO ADDING TYPE A TREATMENT AND LEVELING COURSE. SEE DETAILS FOR PAVING SECTION OVER TRENCH EXCAVATION.

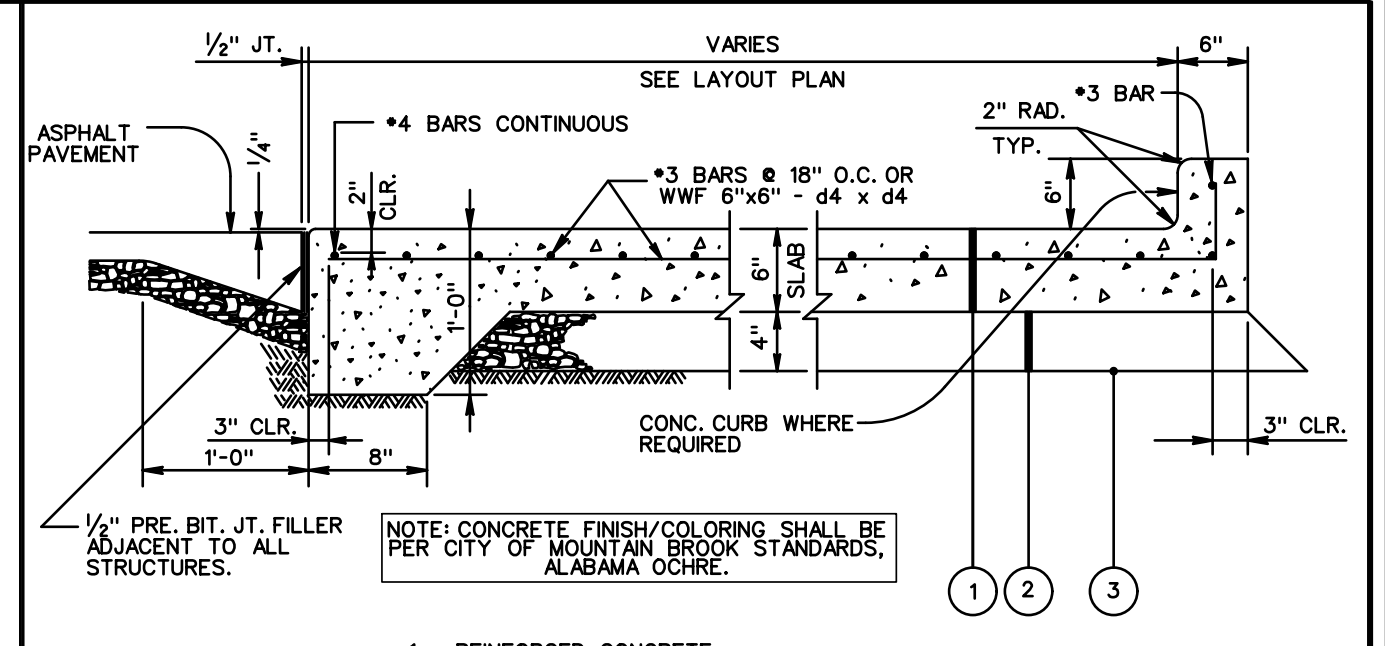


TYPICAL VALVE SETTING
N.T.S.

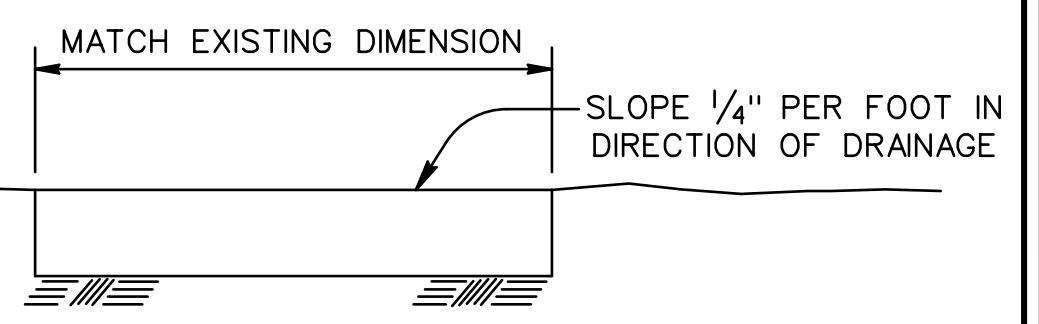


ASPHALT PAVING SHALL BE PER CITY OF MOUNTAIN BROOK STANDARDS AND SPECIFICATIONS.

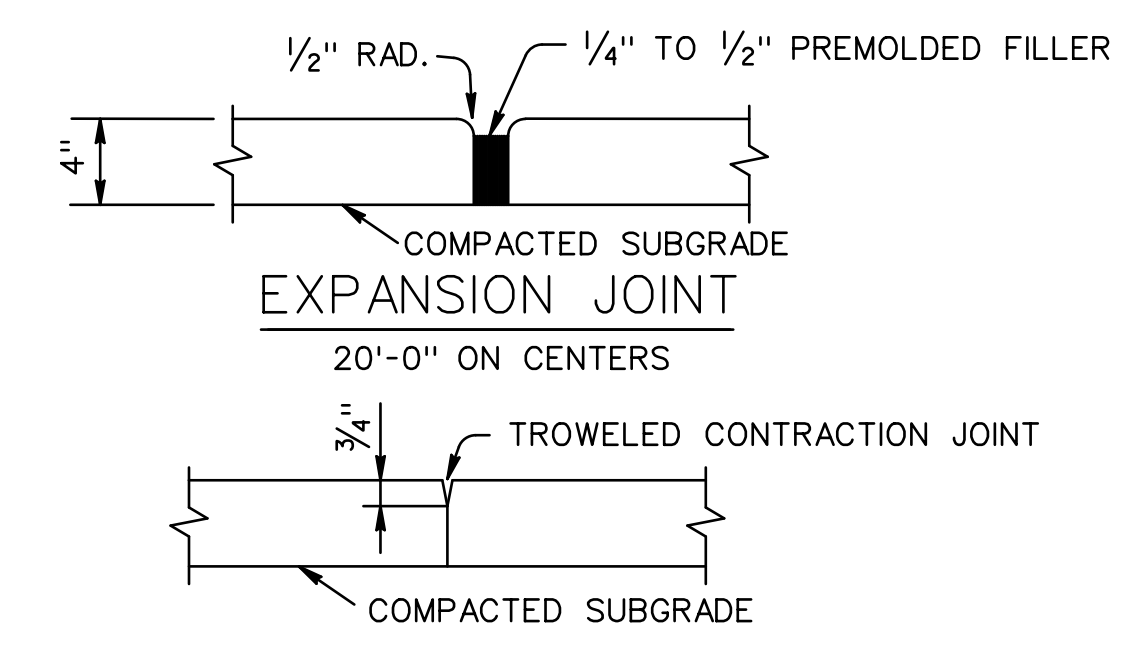
- 3" PAVING ON 6" BASE
1. REQUIRED 1.5" (125 lbs/S.Y.) BITUMINOUS CONCRETE WEARING LAYER (ASPHALT) COMPACTED
 2. REQUIRED TACK COAT 0.05 GAL./S.Y. (MAX)
 3. REQUIRED 2" BITUMINOUS CONCRETE, BINDER LAYER (ASPHALT) (FULL WIDTH)
 4. REQUIRED BITUMINOUS TREATMENT TYPE A (FOR PRIME) (ASPHALT) (FULL WIDTH) 0.23 GAL./S.Y. (APPROX.)
 5. REQUIRED 6" CRUSHED AGGREGATE BASE COURSE IN TWO LAYERS, TYPE B PLANT MIXED (FULL WIDTH) COMPACTED AND EXTENDED UNDER C&G
 6. SUB-GRADE



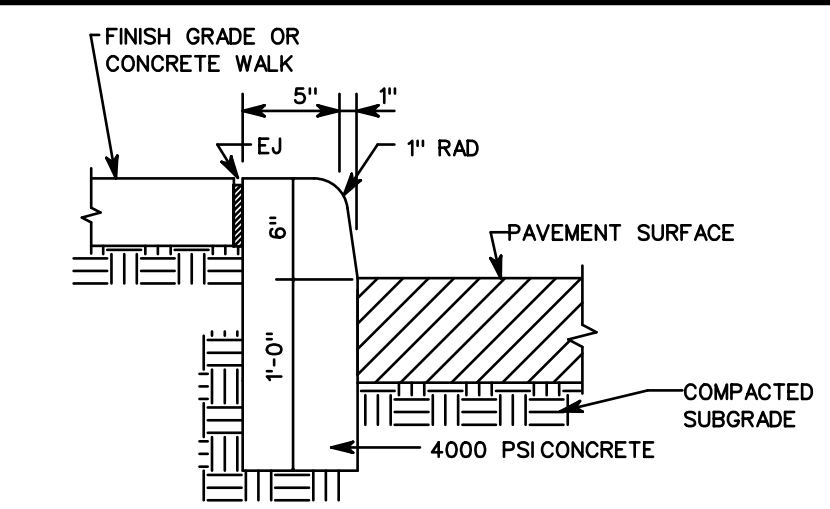
CONCRETE PAVEMENT
N.T.S.



TYPICAL WALKWAY SECTION

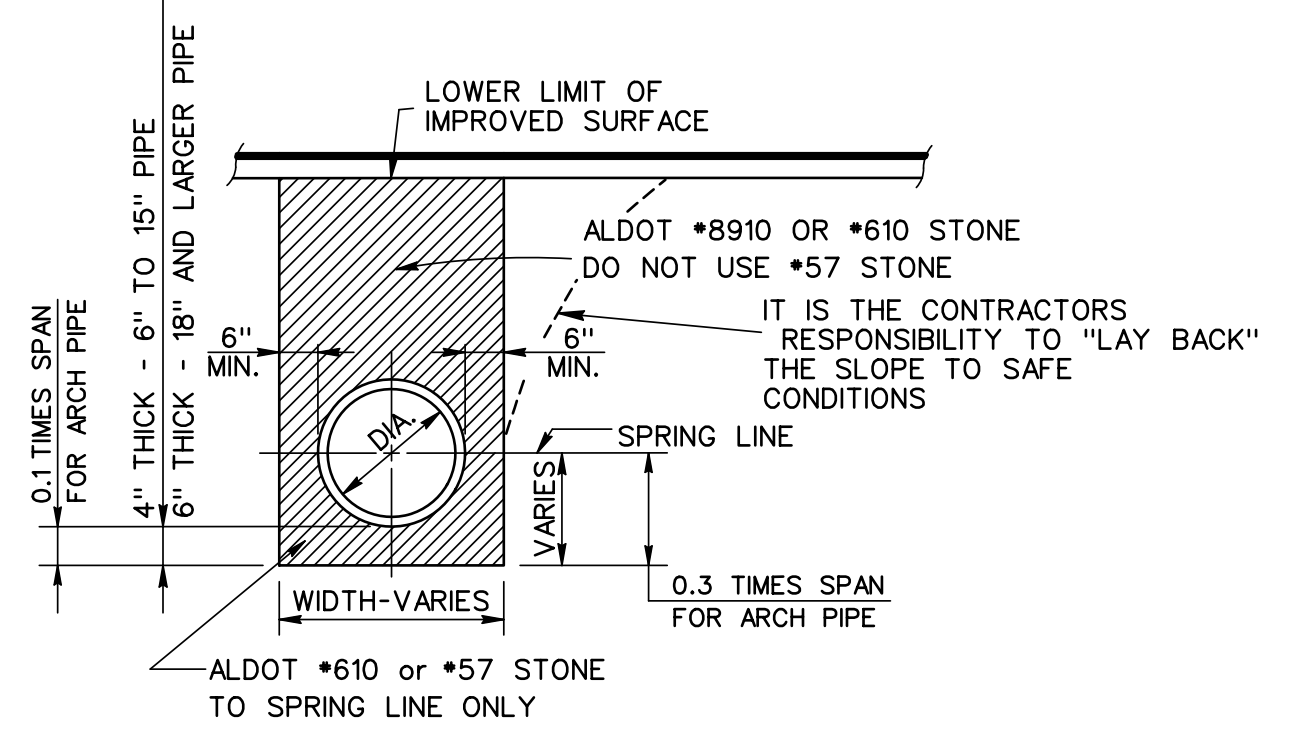


CONCRETE SIDEWALK DETAIL



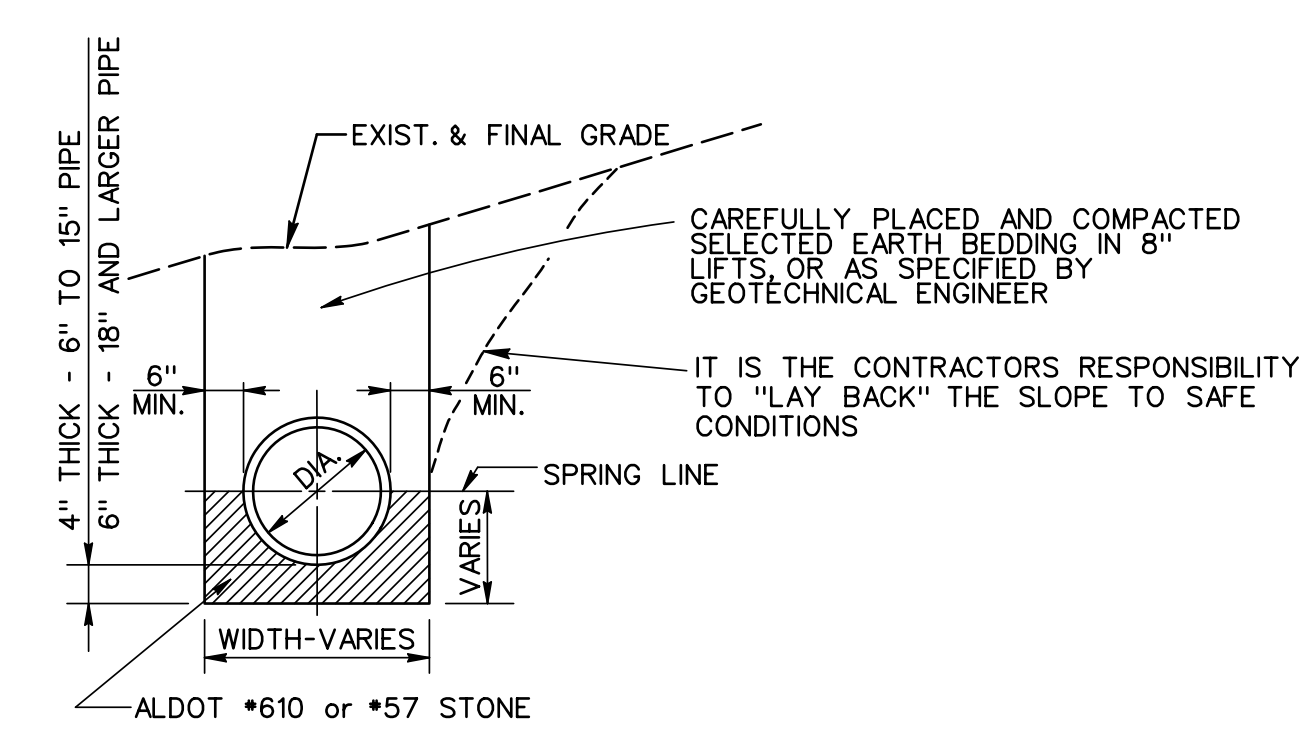
6" STANDUP CONCRETE CURB
N.T.S.

NOTES: 1. 3/4" EXPANSION JOINT REQUIRED AT P.C.'S AND P.T.'S OF ALL CURVES, AT STRUCTURES (CURB INLETS, WHEELCHAIR RAMPS, ETC.) AND EVERY 100' MAX. WITH FILLER MATERIAL.
2. 3/8" SAWED JOINTS REQUIRED ON 20' INTERVALS.



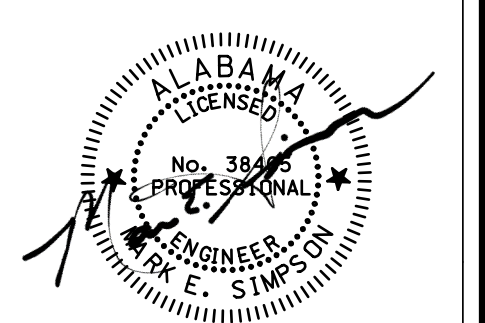
CONCRETE STORM PIPE BEDDING AND BACKFILL UNDER EXISTING IMPROVED SURFACES
NOT TO SCALE

NOTE: THIS PIPE BEDDING AND BACKFILL DETAIL TO BE USED FOR CONCRETE STORM DRAINAGE INSTALLED UNDER EXISTING IMPROVED SURFACES INCLUDING BUT NOT LIMITED TO ROADWAYS, PARKING LOTS, SIDEWALKS, ETC. BEDDING AND BACKFILL FOR SANITARY SEWER MAINS AND LATERALS, AND WATER DISTRIBUTION SYSTEMS SHALL BE PER THE GOVERNING ENTITY'S REQUIREMENTS.



CONCRETE STORM PIPE BEDDING AND BACKFILL UNDER EXISTING UNIMPROVED SURFACES WHERE EXISTING AND FINAL GRADE ARE THE SAME
NOT TO SCALE

NOTE: THIS PIPE BEDDING AND BACKFILL DETAIL TO BE USED FOR CONCRETE STORM DRAINAGE INSTALLED UNDER EXISTING UNIMPROVED SURFACES. BEDDING AND BACKFILL FOR SANITARY SEWER MAINS AND LATERALS, AND WATER DISTRIBUTION SYSTEMS SHALL BE PER THE GOVERNING ENTITY'S REQUIREMENTS.

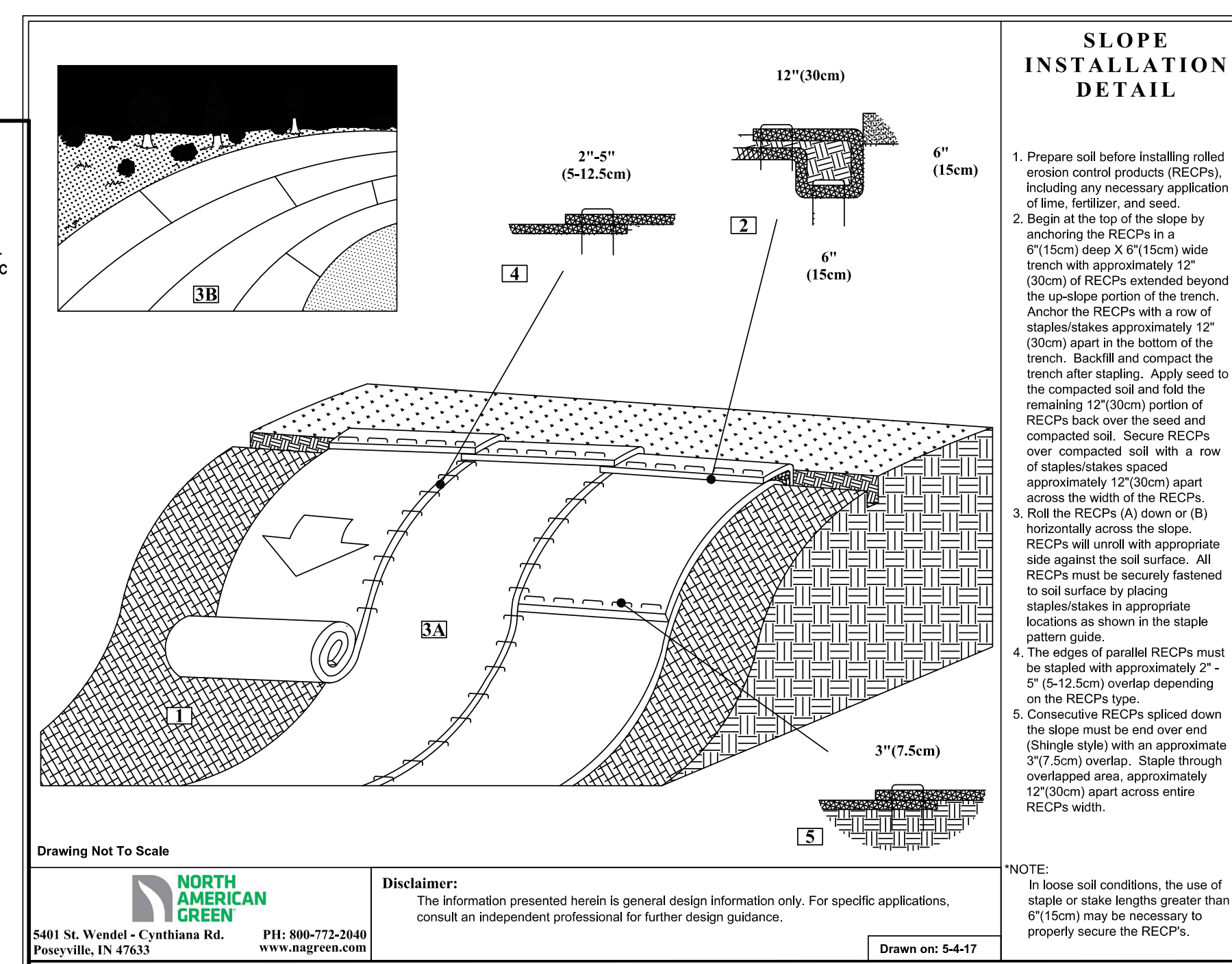
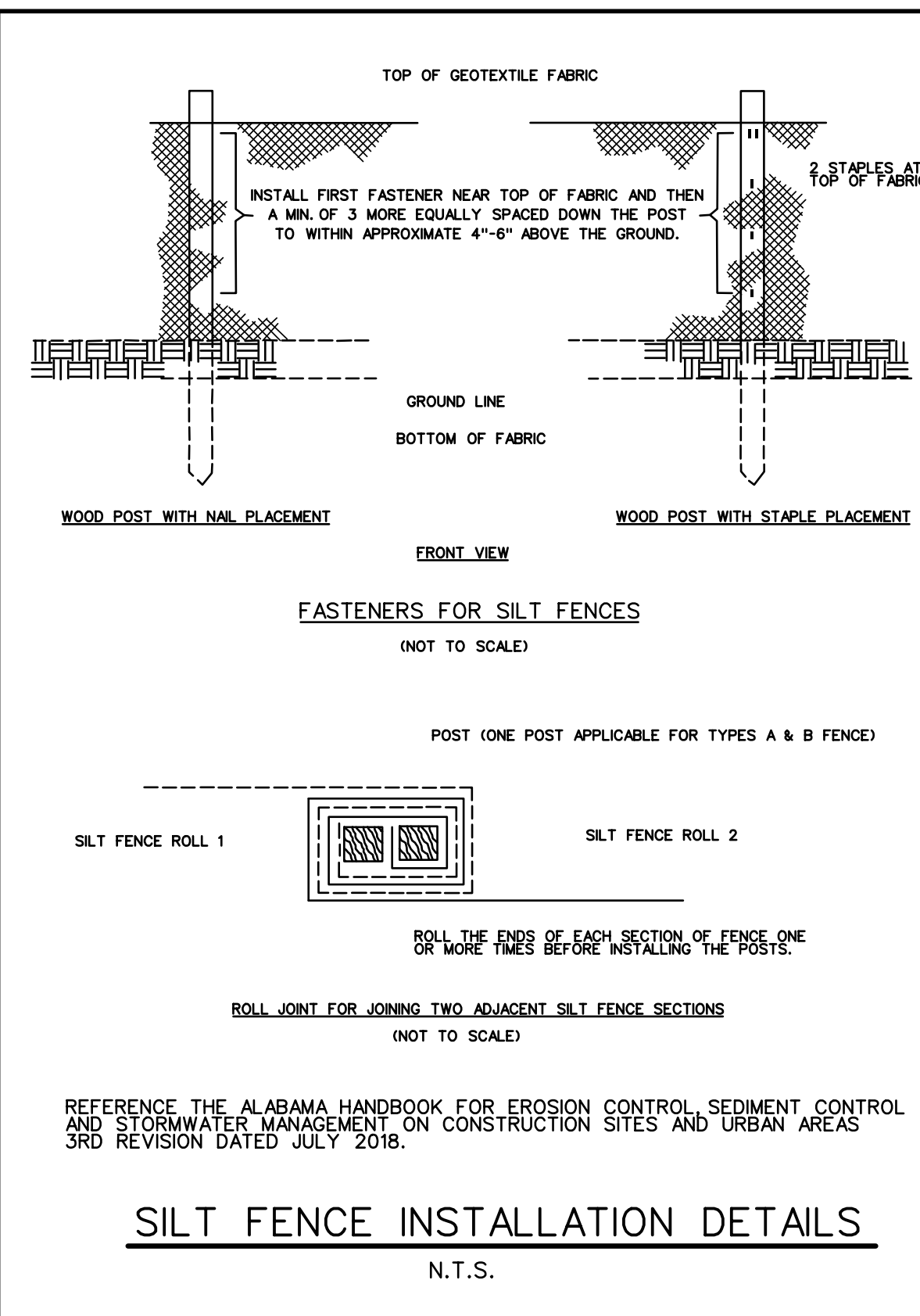
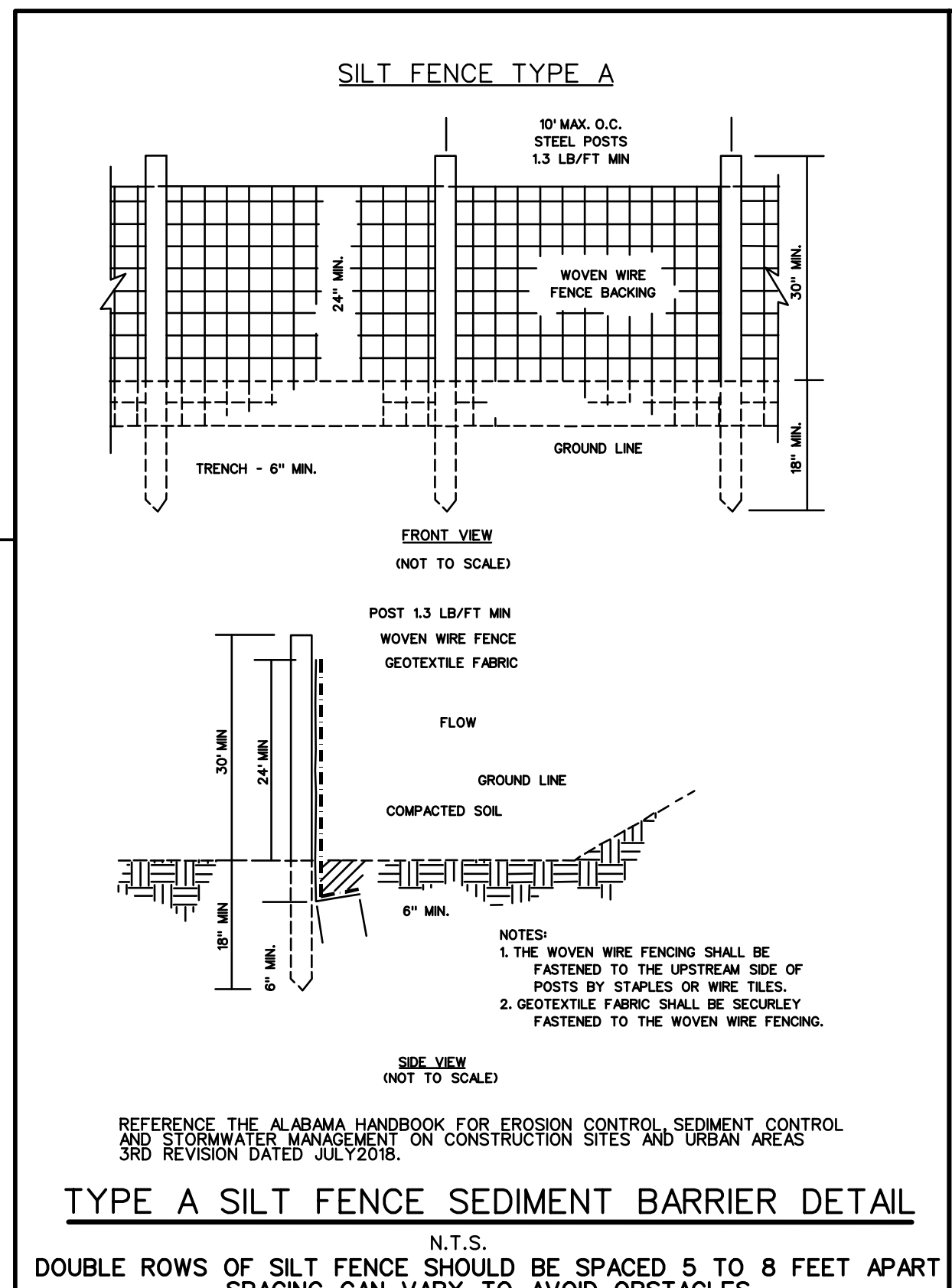
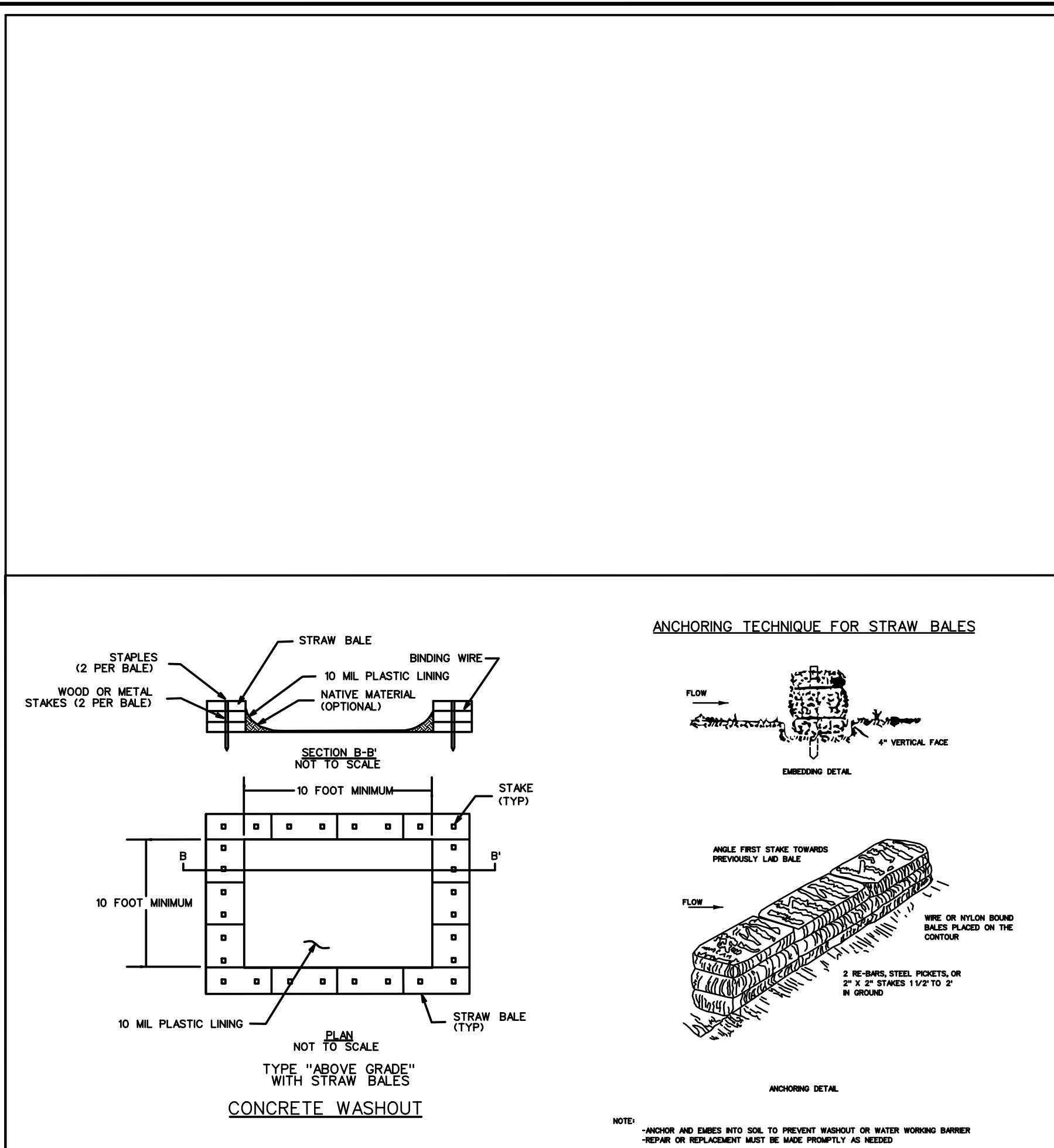


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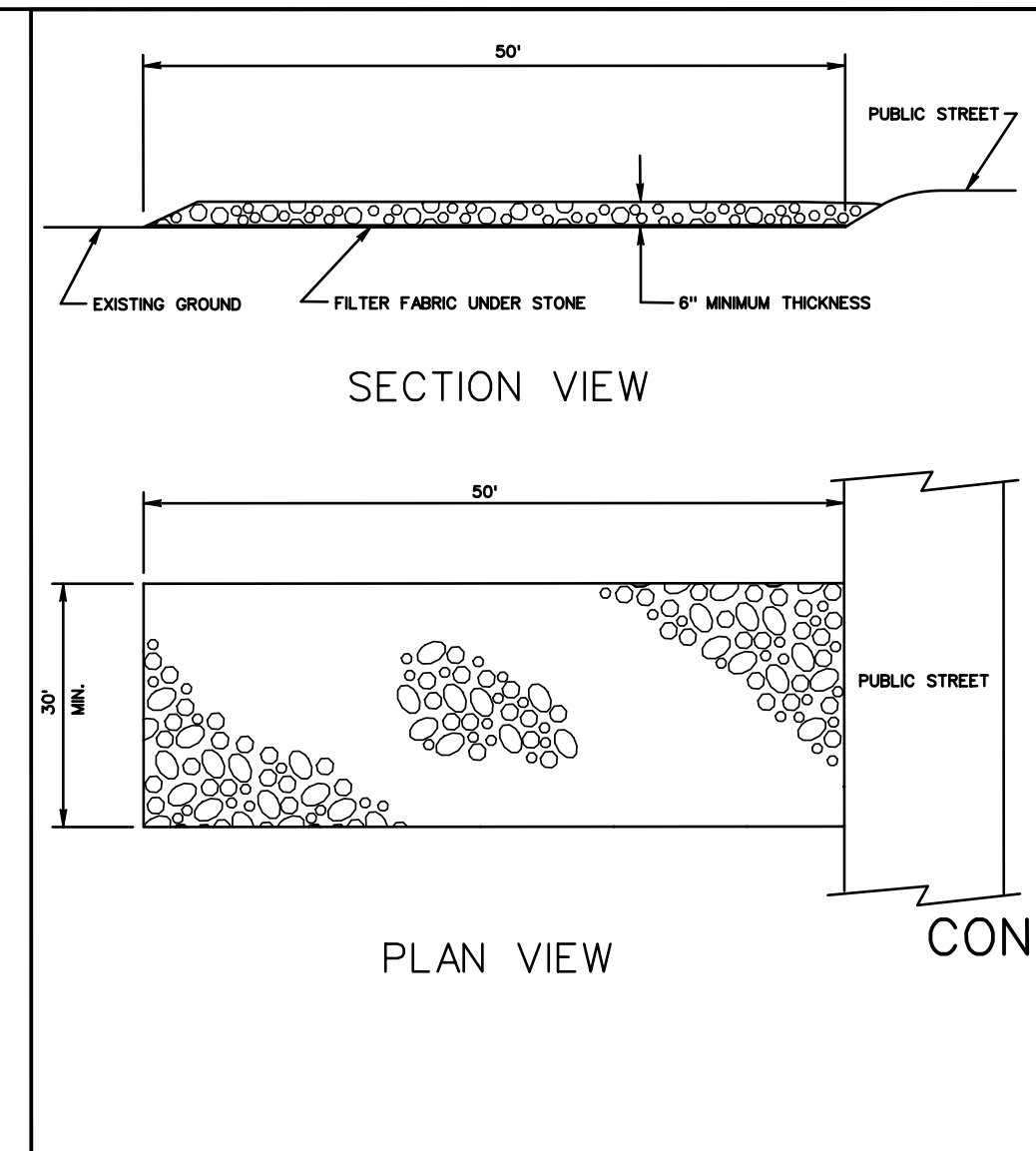
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NOTE: INLET PROTECTION PHASES

1. USE STRAW WATTLE INLET PROTECTION DETAIL FOR INITIAL INLET STRUCTURE INSTALLATION
2. USE STRAW WATTLE CURB INLET PROTECTION DETAIL FOR INITIAL CURB & GUTTER INSTALLATION
3. USE FILTREXX INLET PROTECTION DETAIL AFTER PAVING SURFACE IS APPLIED



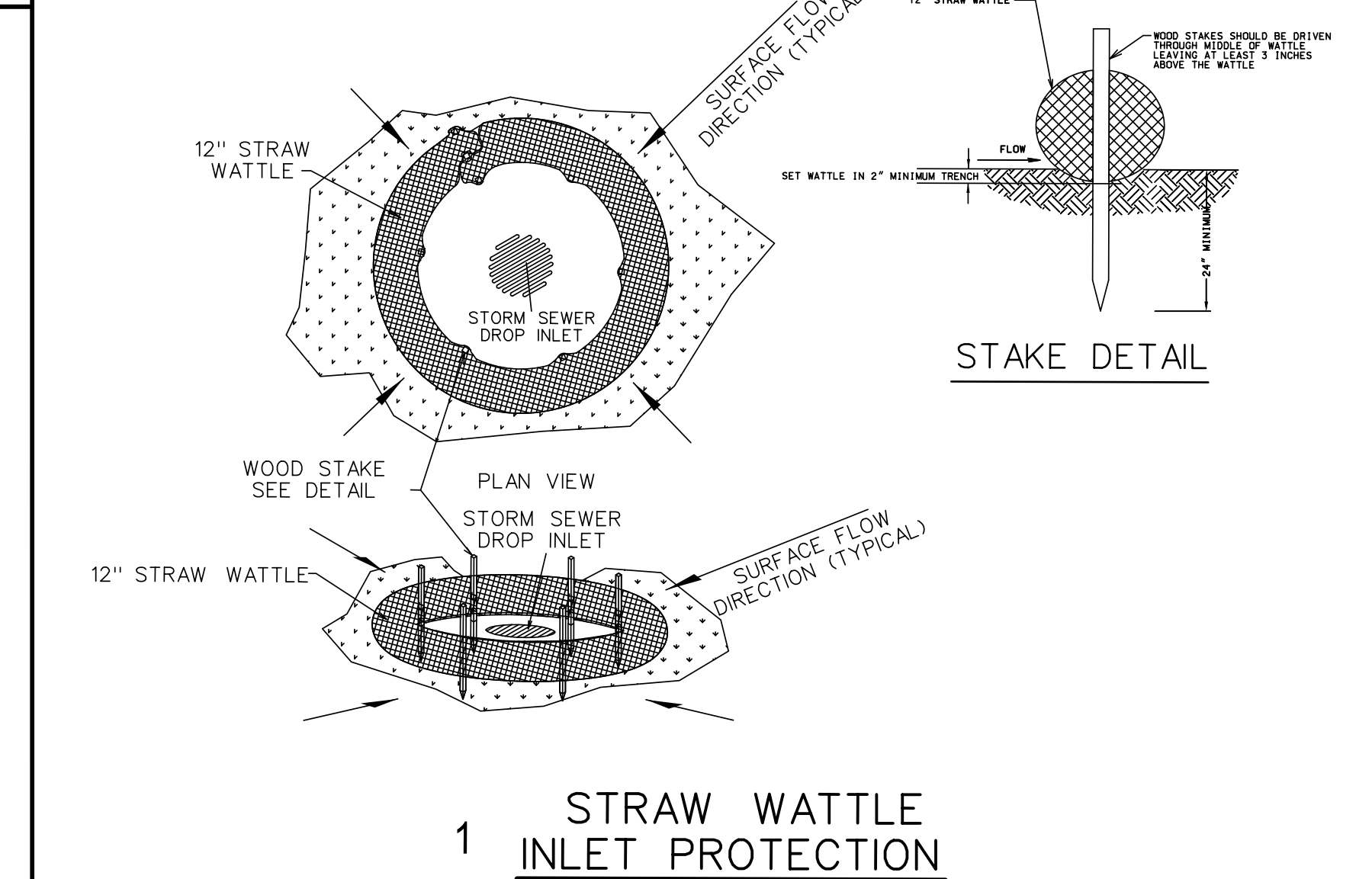
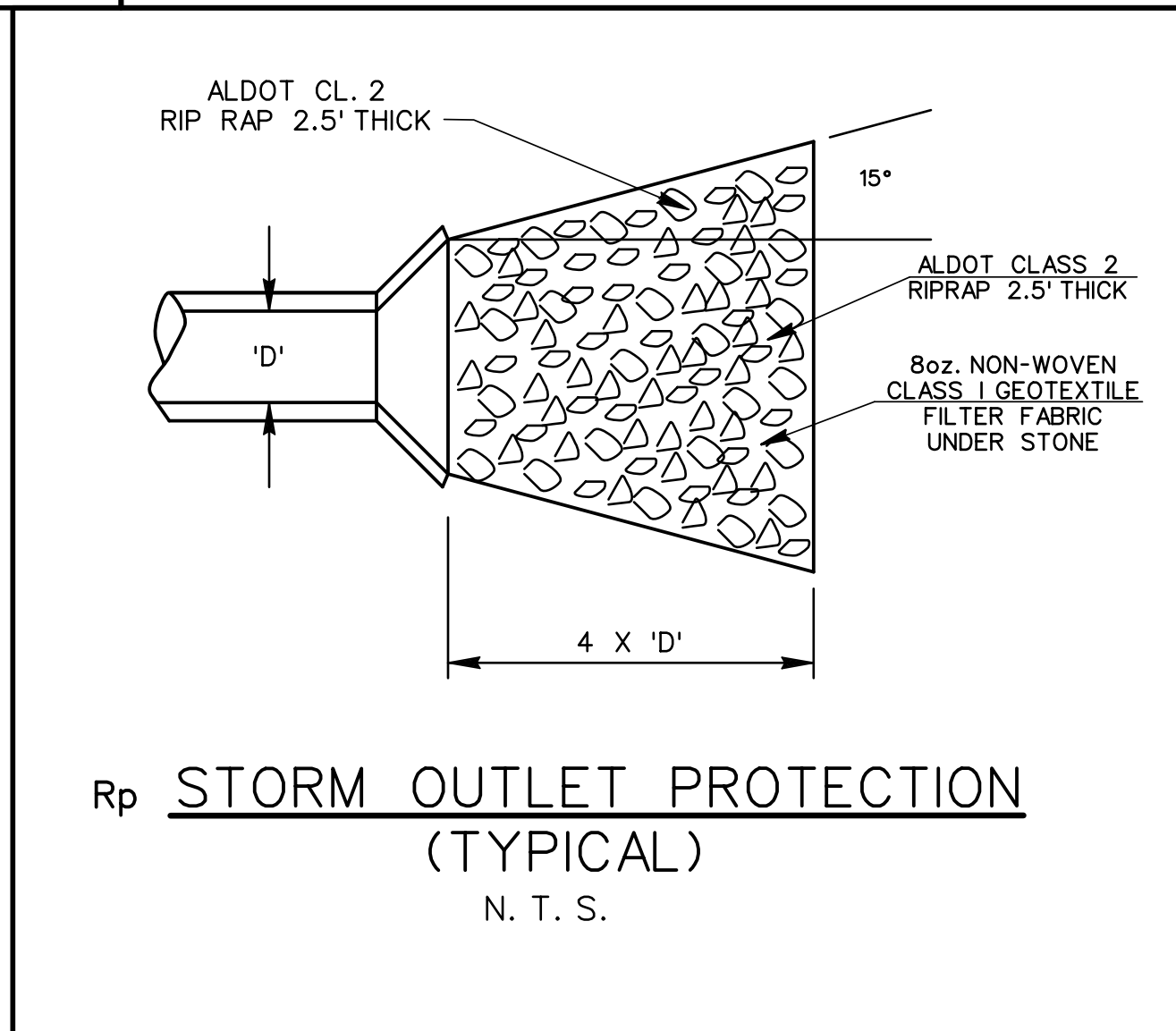
STONE SHALL BE ALDOT COARSE AGGREGATE GRADATION NO.1 STONE WHICH IS 2" TO 3" AVERAGE DIAMETER STONE MATERIAL.

A STABILIZED PAD OF CRUSHED STONE SHALL BE LOCATED WHERE TRAFFIC WILL BE LEAVING OR ENTERING A CONSTRUCTION SITE TO OR FROM A PUBLIC STREET.

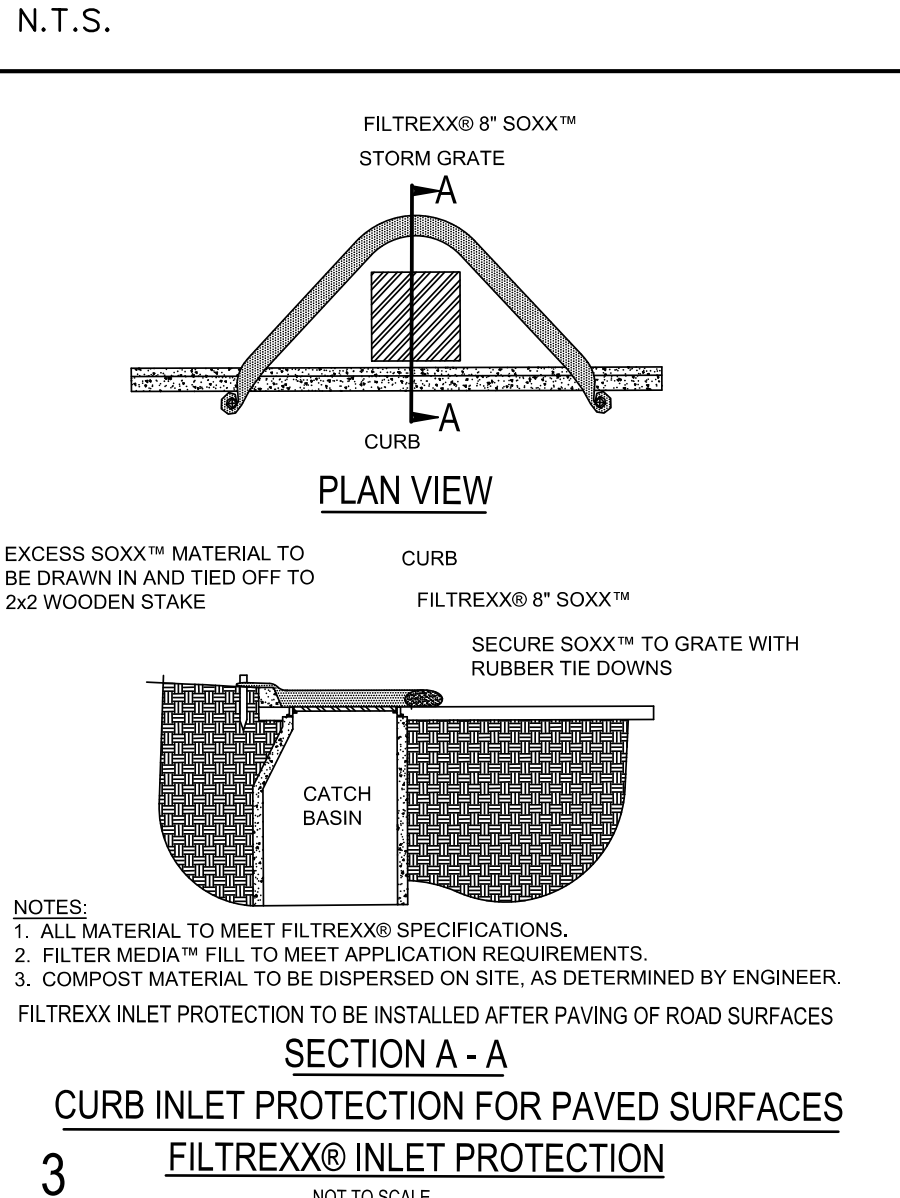
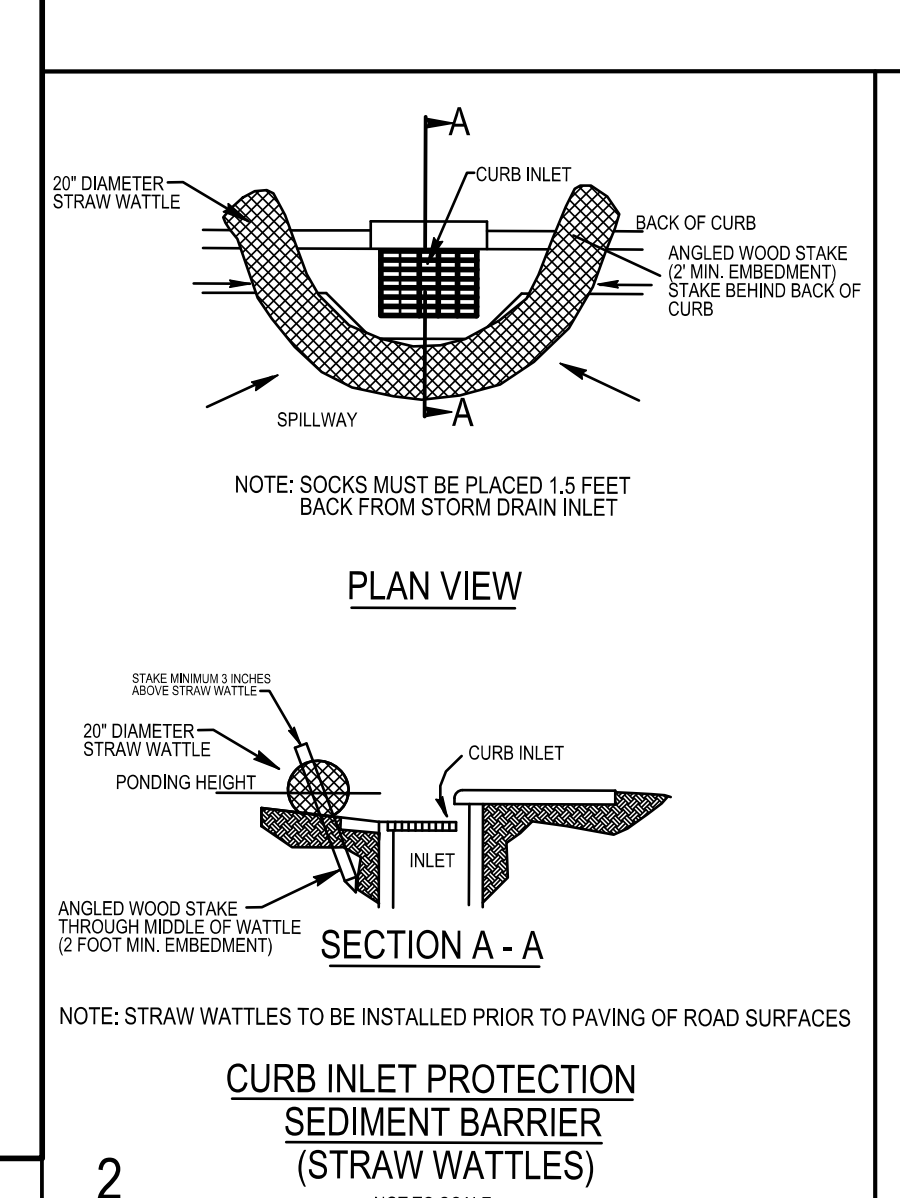
THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC STREETS OR EXISTING PAVEMENT. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.

ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO PUBLIC STREETS MUST BE REMOVED IMMEDIATELY.

FILTER FABRIC SHOULD BE CLASS IV NON-WOVEN GEOTEXTILE (OPTIONAL FOR ACCESS DRIVE)



- EROSION CONTROL NOTES**
1. TEMPORARY EROSION CONTROL DEVICES SHALL BE OBSERVED BY THE OWNER (OR OWNER'S REPRESENTATIVE) ON A PERIODIC BASIS, BUT NOT LESS THAN ONCE PER MONTH, AND THE GRADING CONTRACTOR SHALL MAKE ANY NECESSARY ADJUSTMENTS/REPAIRS AS REQUESTED BY THE OWNER.
 2. THE MEASURES SHOWN ON THE PLANS ARE INTENDED FOR CONTROL DURING SITE CLEARING AND GRADING. ADDITIONAL MEASURES WILL BE REQUIRED AS SITE CONDITIONS CHANGE DURING CONSTRUCTION.
 3. COORDINATE SEDIMENTATION AND EROSION CONTROL MEASURES WITH THE CLEARING AND GRUBBING OPERATION. THESE ACTIVITIES MUST OCCUR IN THE PROPER SEQUENCE IN RELATION TO ONE ANOTHER.
 4. THE CONTRACTOR WILL INSTALL AND MAINTAIN THE EROSION AND SEDIMENTATION CONTROL MEASURES (BOTH TEMPORARY AND PERMANENT) AS A CONTINUING PROGRAM UNTIL THE SITE WORK IS COMPLETE AND THE SITE IS STABILIZED. THIS INCLUDES, BUT IS NOT LIMITED TO, REPAIRS OF DAMAGE FROM STORMS, REGULAR MAINTENANCE, AND REMOVAL / DISPOSAL OF ACCUMULATED SILT. SILT FENCES AND OTHER EROSION CONTROL DEVICES SHOULD BE INSPECTED AFTER EVERY SIGNIFICANT RAIN EVENT.
 5. ALL EROSION CONTROL MEASURES COMPROMISED BY SEDIMENT BUILDUP, INCLUDING RIP RAP, SILT FENCE, HAY DAMS, CHECKS, OR OTHER DEVICES WILL BE REPAIRED OR REPLACED AS NECESSARY.
 6. ANY PIPE, CREEK, OR OTHER STORM DRAINAGE FEATURE SHOWING EVIDENCE OF SEDIMENT ACCUMULATION SHALL BE CLEANED OUT. THE SEDIMENT REMOVED SHALL BE DISPOSED OF IN A LOCATION APPROVED BY THE OWNER OR HIS REPRESENTATIVE.
 7. THE CONTRACTOR IS RESPONSIBLE FOR REMOVAL AND PROPER DISPOSAL OF SILT/SEDIMENT (IF NOT REUSABLE ON-SITE) AND SHALL REMOVE ANY SILT/SEDIMENT BEYOND THE PROPERTY RESULTING FROM CONSTRUCTION OPERATIONS.
 8. DO NOT DEPOSIT WASTE, LOOSE SOIL OR OTHER MATERIALS IN LIVE STREAMS, SWALES OR DRAINAGE WAYS, EXCEPT AS APPROPRIATE FOR EROSION CONTROL (E.G. LOG AND BRUSH CHECKS).
 9. AFTER THE EROSION ACTIVITY HAS STABILIZED, THE CONTRACTOR IS RESPONSIBLE FOR REMOVING THE TEMPORARY EROSION CONTROL DEVICES AT THE DIRECTION OF THE OWNER AND CLEANING UP AND DRESSING THE AREA TO THE SATISFACTION OF THE OWNER.
 10. SILT FENCES ARE TEMPORARY EROSION CONTROL DEVICES THAT SHALL BE ERRECTED OPPOSITE ERODABLE AREAS SUCH AS NEWLY GRADED FILL SLOPES AND ADJACENT TO STREAMS AND CHANNELS.
 11. SILT FENCE BARRIER SHALL BE FABRIC 36 INCHES IN WIDTH (MIN.) AND BE ENVIROFENCE 100X AS MANUFACTURED BY MIRAFL, INC. OR APPROVED EQUAL. SILT FENCE SHALL BE SUPPORTED BY WIRE FENCE, HAVING A MINIMUM OF 6 LINE WIRES AND A MAXIMUM 12" STAY SPACING. WIRE FENCE SHALL BE SUPPORTED BY STEEL POSTS OR WOOD POSTS (4" DIA. OR SQ.) WITH #9 WIRE STAPLES (1/2" LONG MIN.). THE BOTTOM EDGE OF THE FENCE WILL BE PLACED IN AN EXCAVATED TRENCH 6" DEEP AND COVERED AS SHOWN IN THE SILT FENCE DETAIL.
 12. IN FLAT AREAS, SILT FENCES SHOULD BE CONSTRUCTED IN THE SHAPE OF A HORSESHOE, WHENEVER POSSIBLE, SO AS TO AID IN PONDING AND TO FACILITATE SEDIMENTATION.
 13. SILT FENCING OR OTHER APPROPRIATE EROSION CONTROL MEASURES AS DIRECTED ON THE PLANS SHALL BE PLACED AT THE DOWNSTREAM EDGE OF ALL DISTURBED AREAS.
 14. HAY BALES ARE TEMPORARY EROSION CONTROL DEVICES THAT SHALL BE USED IN CONJUNCTION WITH OTHER EROSION CONTROL DEVICES. BALES MAY BE EITHER HAY OR STRAW CONTAINING FIVE (5) CUBIC FEET OF MATERIAL WEIGHING NOT LESS THAN 35 POUNDS AND SECURED WITH TWO STAKES AS SHOWN IN THE HAY BALE DETAIL.
 15. ALL STORM SEWER INLETS IN DISTURBED AREAS OR IN OTHER AREAS SUBJECT TO POTENTIAL INFLOW OF SEDIMENT SHALL BE PROTECTED AT A MINIMUM WITH HAY BALES AND SILT FENCE.
 16. ADDITIONAL SILT FENCES, HAY BALES OR CHECK DAMS MAY BE REQUIRED TO CONTROL SILTING OR EROSION AS CONSTRUCTION PROGRESSES. THIS NEED WILL BE ADDRESSED DURING THE PERIODIC INSPECTIONS CALLED FOR IN GENERAL NOTE 1.
 17. ALL DISTURBED AREAS THAT WILL REMAIN INACTIVE FOR MORE THAN 14 DAYS MUST BE SEEDED AND MULCHED.
 18. AS NECESSARY, ON-SITE PROTECTION IN ADDITION TO THE ABOVE MUST BE PROVIDED THAT WILL PREVENT SILT FROM LEAVING THE PROJECT CONFINES DUE TO EXTREME WEATHER CONDITIONS OR ACCIDENTS.
 19. ANY DISTURBANCE OF SOIL AND VEGETATION OUTSIDE THE LIMITS OF THE CLEARING LINE WILL NOT BE PERMITTED UNDER ANY CONDITION.
 20. PREVENT RUN-ON AND RUN-OFF FROM SOIL PILES BY SURROUNDING PILE WITH HAY BALES AND/OR SILT FENCE.
 21. PREVENT AND CONTROL SOIL EROSION AND GULLING WITHIN THE PROPERTY COVERED BY CONTRACT AND THE ADJACENT PROPERTIES AS A RESULT OF CONSTRUCTION.
 22. CONSTRUCT ROADSIDE DITCHES AS REQUIRED DURING ROAD CONSTRUCTION TO ALLOW STORM RUNOFF TO DRAIN.
 23. ALL CONSTRUCTION STREAM CROSSINGS SHALL HAVE A 24" DIAMETER PIPE (OR LARGER, AS SUGGESTED BY THE ENGINEER) INSTALLED TO CONVEY RUNOFF. THE AREA WHERE THE ROAD CROSSES THE STREAM SHALL BE RIP-RAPPED AS REQUIRED TO PREVENT SEDIMENT WASH-OFF FROM THE ROAD.
 24. AN ACCESS ROUTE SUFFICIENT TO ALLOW THE USE OF APPROPRIATE MAINTENANCE EQUIPMENT SHALL BE EXTENDED TO EACH STRUCTURAL EROSION CONTROL DEVICE.
 25. THE CONTRACTOR IS RESPONSIBLE FOR PROPER COLLECTION, STORAGE, AND DISPOSAL OF SOLID AND SANITARY WASTES. DISPOSAL OF THESE WASTES SHALL BE OFF-SITE IN AN APPROPRIATELY PERMITTED FACILITY.
 26. THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER ON-SITE HANDLING USE, STORAGE, AND DISPOSAL OF PAINTS, SOLVENTS, CHEMICALS, PESTICIDES, HERBICIDES, FERTILIZERS, OILS, GREASE, FUEL, AND OTHER HAZARDOUS MATERIALS USED DURING THIS PROJECT. APPROPRIATE SPILL PREVENTION SHOULD BE PROVIDED FOR ANY CHEMICAL OR HAZARDOUS MATERIAL TO REDUCE EXPOSURE AND CONTAMINATION OF SOILS, STREAMS, CHANNELS, AND STORM WATER RUNOFF.



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ALABAMA LICENSED PROFESSIONAL ENGINEER
No. 3541
E. SIMPSON

MOUNTAIN LN AND MONTEVALLO LN AREA DRAINAGE IMPROVEMENTS MOUNTAIN BROOK, ALABAMA

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REVISIONS:

DRAWN BY: K.D.
CHECKED BY: M.E.S.
FILE NAME: 23209-DET2

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VII. ANTICIPATED BID/AWARD/PROJECT SCHEDULE

1. April 14 - Issuance of Project Manual
2. April 23 at 10:00am.- Mandatory Pre-Bid
3. May 1 at 5:00 p.m. – Deadline for Interested Contractors to Submit Written Questions
4. May 3 at 5:00 p.m. – City’s Written Answers to Questions
5. May 7 by 10:00 a.m. - Bids & Other Completed Documents Due & Bid Opening
6. May 13 – Anticipated Award Contract by City Council
7. May 24-Deliverables (Bonds & Proof of Insurance) Due from Successful Contractor/Contract Executed
8. June 4 – Issuance Notice to Proceed by City
9. November 1 - Project to be Substantially Completed